6/16/70. Asst Director said not request DDC service as has contract term short. Content matter for field work — DSP

GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station

PROJECT INITIATION

Date: May 28, 1970

Project Title: Radio Propagation Experiment

Project No.: A-1247 X-182

Project Director: Mr. F. B. Dyer

Sponsor: Harry Diamond Laboratories - U. S. Army Materiel Command

Effective . . . . . May 20, 1970* . . . . . Estimated to run until: . . . November 19, 1970 . . . . .

Type Agreement: . Contract No. DAAG39-70-C-0053** . . . . . Amount: $ 10,995.00 . . . . . .

*Pre-contract costs to be allowed effective April 1, 1970.

**Notice of Award received - contract to follow.

Reports: (unknown until contract documents received)

Defense Priority Rating: DO-C9 under DMS Reg. 1.

Assigned to . . . . Electronics (Sensor Systems) . . . . . Division

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GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station

B448

PROJECT TERMINATION

Date 4/9/71

PROJECT TITLE: Radio Propagation Experiment

PROJECT NO: A-1247

PROJECT DIRECTOR: Mr. F. B. Dyer

SPONSOR: Harry Diamond Laboratories - U. S. Army Materiel Command

TERMINATION EFFECTIVE: 2/26/71*

CHARGES SHOULD CLEAR ACCOUNTING BY: 2/28/71

*Date Final Report submitted - Contract expiration was 11/19/70.

Contract Closeout Items Remaining:

Final Invoice & Closing Documents
Final Report of Inventions (DD 882)

Electronics (Sensor Systems) Division

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A-1247

ENGINEERING
GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION 225 North Avenue, Northwest · Atlanta, Georgia 30332

17 February 1971

Mr. Louis M. Tozzi
Branch 120
Harry Diamond Laboratories
Van Ness & Connecticutt Ave.
Washington, D.C.

Reference: Contract DAAG39-70-0053

Subject: Final Report on Radio Propagation Experiment

Dear Mr. Tozzi:

The purpose of this letter is to provide you with a summary report of the events and data from the radio propagation experiment which was performed at the Boca Raton, Florida, Field Site during September 1970. Attached to this letter are additional data from the field operation and investigations which followed. These data include: (1) a summary of received-power-versus-range measurements; (2) distribution function plots of the received power for the radio frequencies and the radar return from the boat; (3) additional meteorological data together with some interpretation of it; and (4) auto- and cross-correlation plots of selected data runs.

The actual periods of data acquisition included 3, 8, 10, 16, and 22 September. The data which were obtained on the 3rd of September would appear to be inconsistent with later measurements. This is probably due to the difficulties encountered in obtaining good calibration data in this first operation, plus difficulties with the float and transmitter assembly. The care and control of the experiment were improved sufficiently by the tenth that the data from that date and the remainder of the operation were consistent and of reasonable quality; therefore, it is believed they are representative of the results that can be obtained with this type of experiment.

Due to instrumentation difficulties, it was not until the 22nd that quality data were obtained on instrumentation magnetic tape. The tape recordings that were made on the 22nd are of sufficient quality to allow computation of amplitude distributions, noncoherent spectral densities, and auto- and cross-correlation functions in the laboratory.

Various sea conditions were encountered during this month of operation; however, the ability to make use of the higher seas was limited due to difficulties with the instrumentation boat and the floating package. As a consequence, only one day - the sixth - provided good data for high-sea conditions.

A review of the plots of received power versus range shows that all three of the principal radio frequencies exhibit very similiar range behavior. The consistency of shape of the range plots for all runs except those of 3 September is remarkable. The range behavior is also consistent with that predicted by the methods developed by K. A. Norton [Attachment II, Reference 2]. The results do not exhibit any clear evidence of modification by the effects of either super-refraction or ducting. Several possibilities can be offered in explanation: (1) atmospheric conditions were such that the same propagation conditions existed during all measurement periods; (2) measurements were not made at ranges such that "ducting" would be a significant factor; or (3) the geometry of the experiment (i.e., antenna heights, surface conductivity, etc.) has made the results approximately independent of the range of conditions encountered during these measurements. The data at hand, together with the limited analyical studies which have been undertaken on this project, are insufficient to fully resolve the question of the influence of atmospheric propagation conditions on the basic communications problem which these experiments were designed to explore.

The data available from this investigation do not answer all the questions which were considered, but the results show that the stated goals of the communications problem can be met without requiring enhancement by ducting and that any of the frequencies choosen for this investigation can be used (based on signal strength versus range only). While the results of the experiments are adequate to demonstrate the practicality of using these frequencies and power levels to solve the basic communications problem, additional investigations would be necessary to determine, in detail, the effects of atmospheric propagation, precipitation, and surface roughness on the performance of the ultimate system. Refinements in instrumentation and repackaging of the transmitter would be important parts of such a future program. It would also be desirable to consider the possibility of using vehicles with higher mobility, such as helicopters or aircraft, for extending the operating envelope of future experiments. Also, since the range requirements can be met over the entire frequency band, the choice of operating frequency should be based on other considerations such as equipment reliability, direction finding, or frequency allocation.

We at Georgia Tech would like to extend our appreciation to the scientific personnel at the Harry Diamond Laboratories who have participated in this program. Their interest and guidance have been valuable to the achievement of the goals of this program. Please let us know if we can be of any assistance in your future work.

Yours truly,

F. B. Dyer
Project Director

Approved:

R. M. Goodman, Jr.
Head, Sensor Systems Branch

cc: Addressee (3)
ONR Resident Representative
Sensor Systems Branch
Project Files
GTRI Files

LIST OF ATTACHMENTS

ATTACHMENTS

TO

FINAL REPORT

ON

DAAG39-70-C-0053

ATTACHMENT I

Received Signal Strength Data
From 22 September 1970

The data assembled here were obtained simultaneously with those recorded by the personnel in the HDL Instrumentation Van. They are presented here in order to demonstrate the reproducibility of the measurements during this series of experiments and to provide supplemental information about the statistics of the received signals.

Figures I-1 through I-3 show the range behavior of the received signals on 22 September. The plots are of the median values listed in Table I; the limits which are shown are the 10 and 90 percent points of the normalized cummulative amplitude distributions which were computed for each data run. All data here were obtained by the use of the Fabri-Tek Model 1072 Signal Averager, which was configured for collection of voltage distributions. The data were obtained in 20-second intervals at a 10-Hz rate, and the resulting voltage distributions were calibrated in received signal strength in dBm by the use of a signal generator standard. The actual receiver output and line loss used for each data point are included in Table I. The summary in Table I includes both the 10-percent and 90-percent points on the distributions as well as the median in order to provide a comparison of the distribution widths at the various range points. Copies of the data logs and distributions are included, so that addition interpretations of the distributions may be undertaken if desired.

The data logs show that measurements were made also on the radar return (9400 MHz) from the instrumentation boat and of the received signal strength of the Citizen's Band communication system (27 MHz). These data were recorded in order to supplement the primary measurements with information for use in interpreting the results of the experiment in cases where unusual behavior might be observed. Review of the results indicates that these supplementary data are generally consistent with the primary measurements, and thus the distributions are included here but not analyzed in detail.

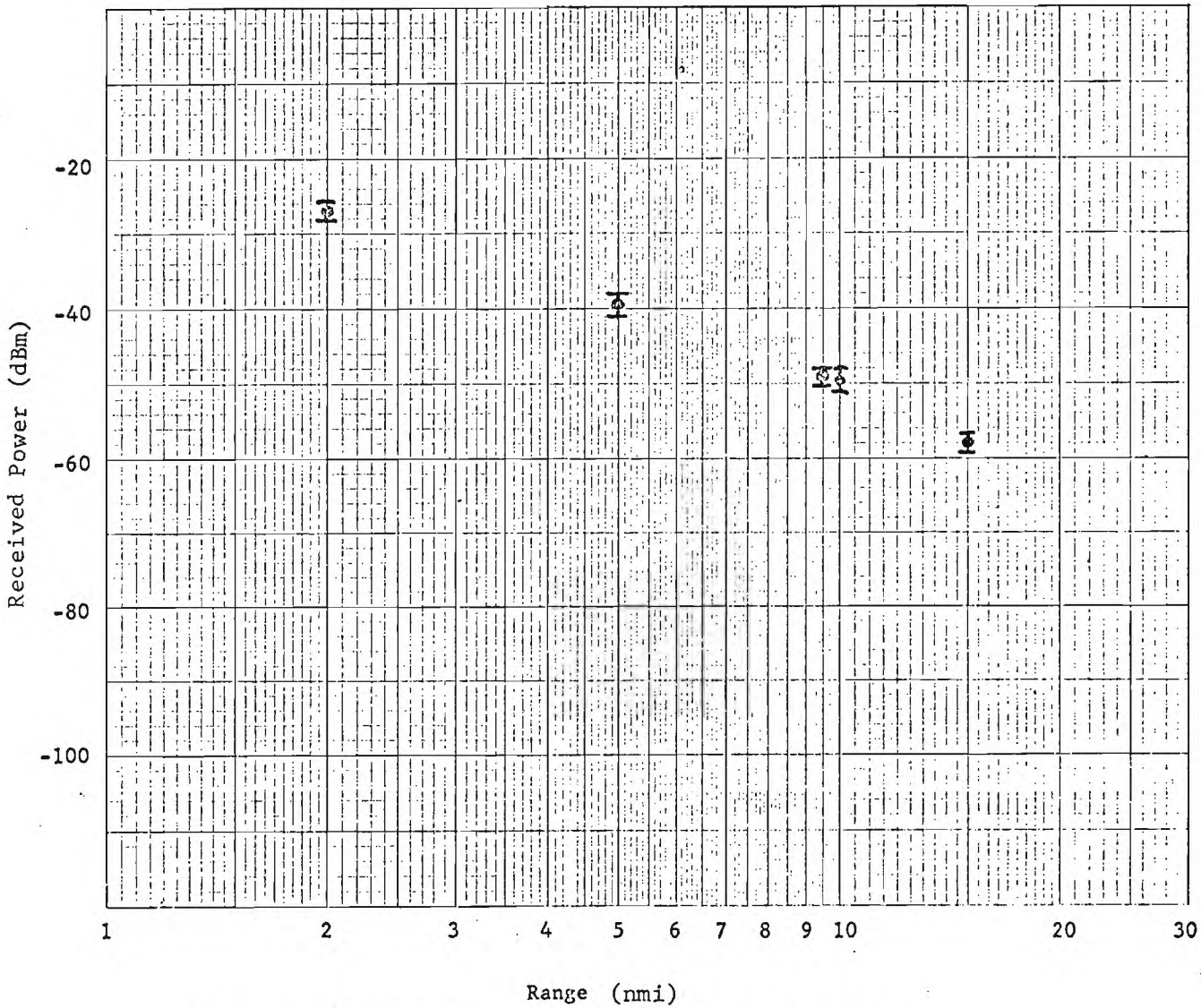


Figure I-1. Received power versus range at 30 MHz.
(22 September 1970)

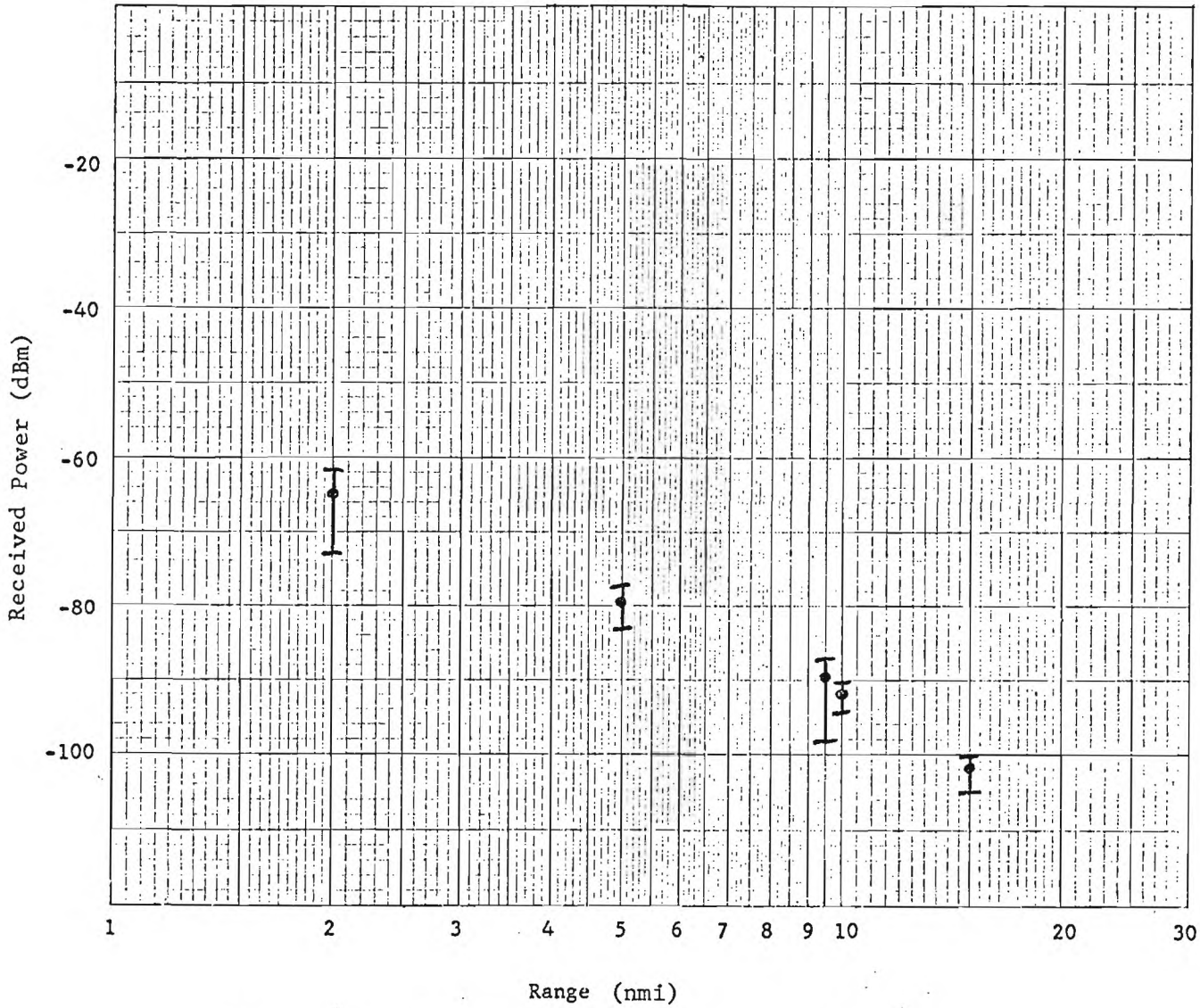


Figure I-2. Received power versus range at 140 MHz.
(22 September 1970)

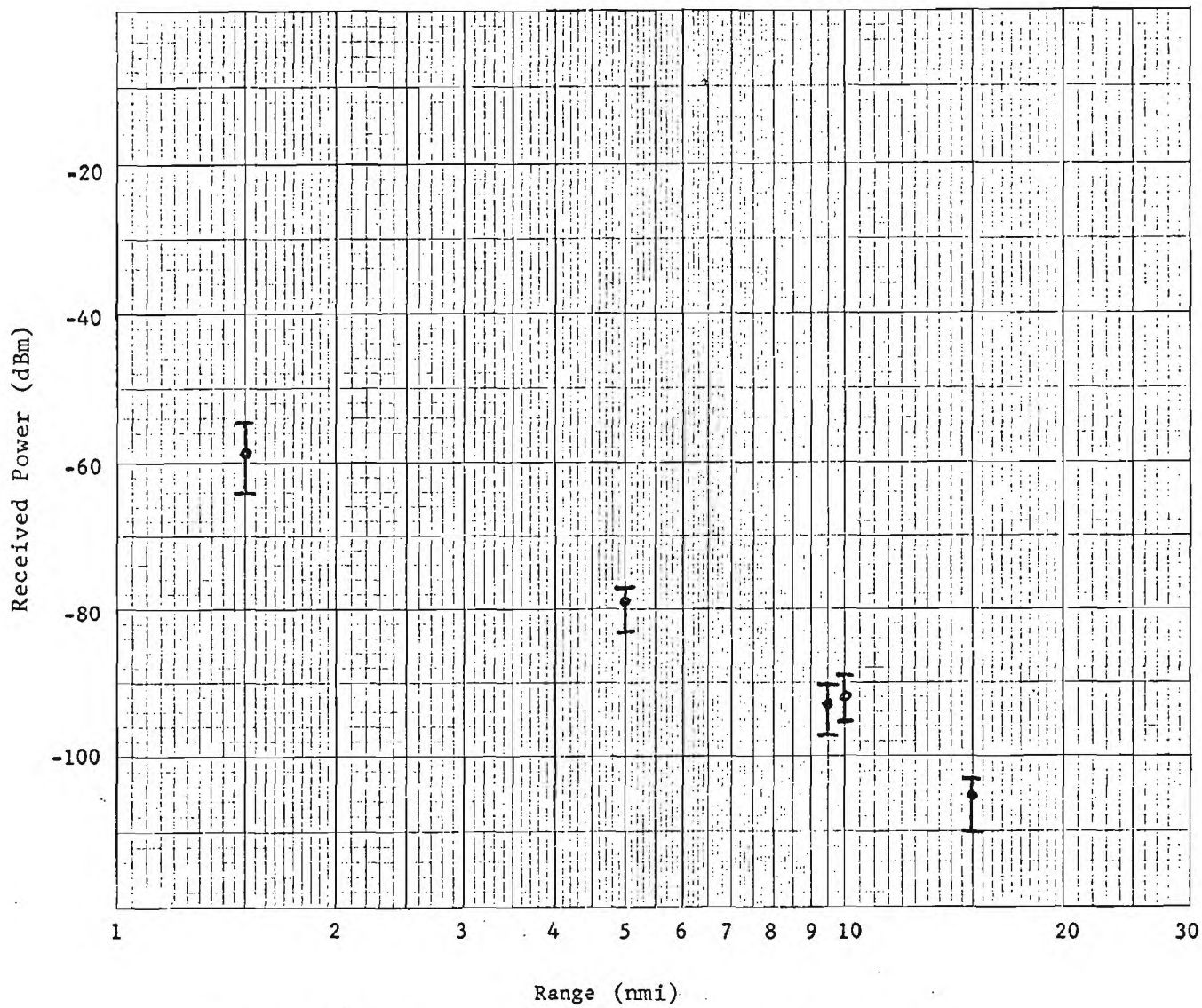


Figure I-3. Received power versus range at 412 MHz.
(22 September 1970)

TABLE I-1. SUMMARY OF MEASUREMENTS ON 22 SEPTEMBER 1970

Frequency (MHz)	Time	Run #	Range (nmi)	Measured Output* (dB) 0.1	0.5	0.9	Line Loss (dB)	Received Signal* (dBm) 0.1	0.5	0.9	Comment
30	1510	13	2.0	91.9	90.6	89.7	64	27.9	26.6	25.7	
30	1424	11	5.0	94.1	92.5	91.1	53	41.1	39.5	38.1	
30	1312	8	9.5	90.0	88.9	88.0	40	50.0	48.9	48.0	
30	1010	2	10.0	93.0	91.5	90.0	42	51.0	49.5	48.0	
30	1204	7	15.0	92.0	90.2	89.9	33	59.0	57.9	56.9	
140	1510	13	2.0	106.0	97.7	94.7	33	73.0	64.7	61.7	60 Hz Modulation on Signal
140	1424	11	5.0	101.8	98.6	96.2	19	82.8	79.6	77.2	
140	1312	8	9.5	105.0	96.5	93.9	7	98.0	89.5	86.9	60 Hz Modulation on Signal
140	1010	2	10.0	101.4	99.1	97.5	7	94.4	92.1	90.5	
140	1204	7	15.0	104.8	102.1	100.6	0	104.8	102.1	100.6	
412	1510	13	2.0	130.0	124.7	120.6	66	64.0	58.7	54.6	
412	1424	11	5.0	125.8	121.9	119.9	43	82.8	78.9	76.9	
412	1312	8	9.5	127.0	122.9	120.3	30	97.0	92.9	90.3	
412	1010	2	10.0	126.3	123.0	120.4	31	95.3	92.0	89.4	
412	1204	7	15.0	128.0	123.6	121.2	18	110.0	105.6	103.2	

*Measurements refer to values obtained from the cummulative probability distributions which were computed.

TABLE I-2. SUMMARY OF EVENTS ON 22 SEPTEMBER 1970.

Date 22 Sept. 1970 (day mo. yr.) Recorder J. C. Butterworth Operators J. C. Butterworth, E. C. Burdett

Radar A 30 MHz Rec. D. C B Rec.

Radar B 140 MHz Rec. E. X-Band Rapid HH

Radar C 412 MHz Rec.

All sampled at 10 KHz for 20 sec. except X-Band. X-Band 10 Hz for 80 sec.

Run	Begin	End	Range	Az.	Target	Channel Q_1	Q_2	Q_3	Q_4	
1	0850		Radar	Calibration						-30 dbm to noise in 10 db steps. Weather at 10 mi: Sea 8 to 10 ft, Wind NE 15 to 18 K
2	1010	1036	10 mi	105°		A	B	C		Freq. 412 MHz / 140 MHz / 30 MHz
			9.5 mi							line Atten. 31 db / 7 db / 42 db
										Signal Gen. -71 dbm / -73 dbm / -50 dbm
3										Pad 20 db / 20 db / ---
										-122 / -93 / -92
	1125									Weather on shore: Sea 4 ft, Wind ENE 13
4	1129		13.2	88°					E	Mesh Corner, E C B
5	1137		13.8	88°					E	Mesh Corner, E C B
6	1146		14.4	88°					D	C B Radio

Page No. 1 From ____ To ____

TABLE I-2. SUMMARY OF EVENTS ON 22 SEPTEMBER 1970 (Continued).

Date 22 Sept. 1970 (day mo. yr.) Recorder J. C. Butterworth Operators J. C. Butterworth, E. C. Burdett

Radar A 30 MHz Rec. D. C B Rec.

Radar B 140 MHz Rec. E. X-Band Rapid HH

Radar C 412 MHz Rec.

All sampled at 10 KHz for 20 sec. except X-Band. X-Band 10 Hz for 80 sec.

Run	Begin	End	Range	Az.	Target	Channel Q_1	Q_2	Q_3	Q_4				
7	1204		15 mi.	88°		A	B	C		Freq.	412 MHz	140 MHz	30 MHz
										Line Atten.	18 db	0 db	33 db
										Signal Gen.	-85 dbm	-84 dbm	-58 dbm
										Pad	20 db	20 db	---
											-123	-104	-91
8	1312		9.5 mi	85°		A	B	C		Freq.	412 MHz	140 MHz	30 MHz
										Line Atten.	30 db	7 db	40 db
										Signal Gen.	-36 dbm*	-72 dbm	-52 dbm
										Pad	-20 db	-20 db	---
											-85*	-99	-92

* -36 dbm must be error in initial reading. Checked calibration at 412 MHz 30 db in line, results -72 dbm. This gives a total sensitivity -122 dbm

Page No. 2 From ____ To ____

TABLE I-2. SUMMARY OF EVENTS ON 22 SEPTEMBER 1970 (Continued).

Date 22 Sept. 1970 (day mo. yr.) Recorder J. C. Butterworth Operators J. C. Butterworth, E. C. Burdett

Radar A 30 MHz Rec. D. C B Rec.

Radar B 140 MHz Rec. E. X-Band Rapid HH

Radar C 412 MHz Rec.

All sampled at 10 KHz for 20 sec. except X-Band. X-Band 10 Hz for 80 sec.

Run	Begin	End	Range	Az.	Target	Channel Q_1	Q_2	Q_3	Q_4	
9	1403		6.8	80°					D	C B Radio
10	1407		6.2	80°		E	E			Mesh Corner, E C B Mesh Corner, J C B Fabritek sample rate 10 KHz
11	1424		5.0	82°		A	B	C		Freq. 412 MHz 140 MHz 30 MHz Line Atten. 43 db 19 db 53 db Signal Gen. -60 dbm -60 dbm -38 dbm Pad 20 db 20 db --- -123 -99 -91
12			3.5	82°					D	C B Radio

Page No. 3 From To

TABLE I-2. SUMMARY OF EVENTS ON 22 SEPTEMBER 1970 (Continued).

Date 22 Sept. 1970 (day mo. yr.) Recorder J. C. Butterworth Operators J. C. Butterworth, E. C. Burdette

Radar A 30 MHz Rec. D. C B Rec.

Radar B 140 MHz Rec. E. X-Band Rapid HH

Radar C 412 MHz Rec.

All sampled at 10 KHz for 20 sec. except X-Band. X-Band 10 Hz for 80 sec.

Run	Begin	End	Range	Az.	Target	Channel Q_1	Q_2	Q_3	Q_4
13			2 mi	95°		A	B	C	
			1.5 mi	for 412 MHz only					
14	1554		1.5 mi						D
15	C B Calibration								
		END OF OPERATION							

	412 MHz	140 MHz	30 MHz
Freq.			
Line Atten.	66 db	33 db	64 db
Signal Gen.	-37 dbm	-47 dbm	-27 dbm
Pad	20 db	20 db	---
	-123	-100	-91

C B Radio

1. Transmitter antennas at sea level.
2. Receiving antennas at 56 feet above mean water.
3. Receiving antenna gains:
   30 MHz - 10 dB (nominal)
   140 MHz - 10 dB (nominal)
   412 MHz - 20 dB (nominal)
4. Radiated power:
   30 MHz - 15 watts
   140 MHz - 2.25 watts
   412 MHz - 6 watts

Page No. 4 From To

SIGNAL

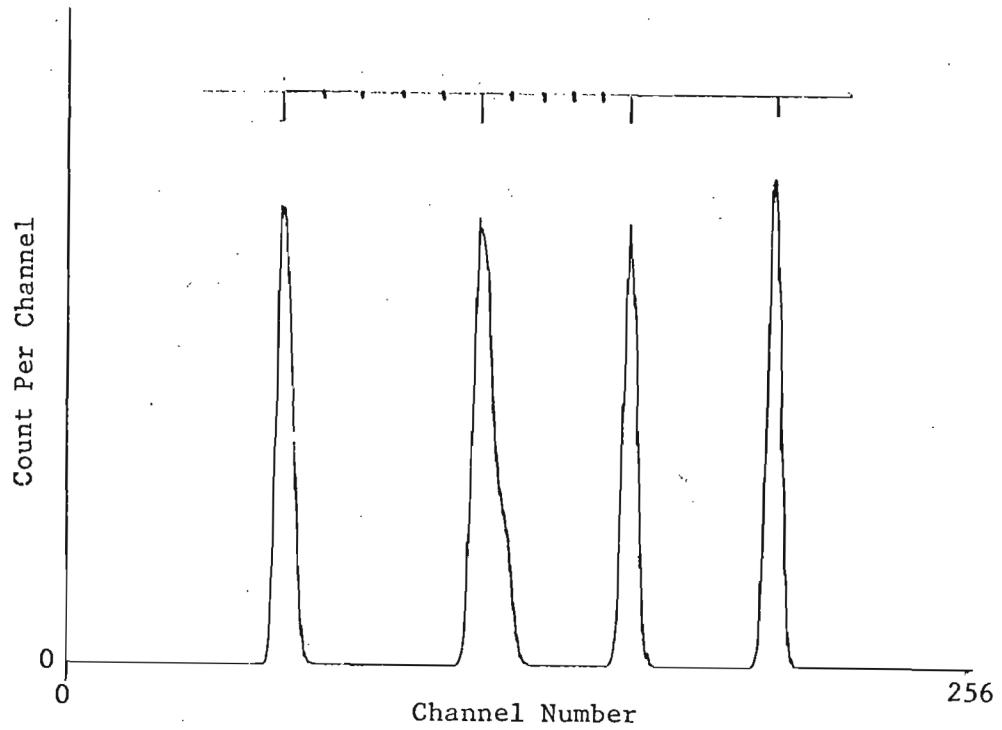
DISTRIBUTIONS

AT

30, 140, 412 MHz

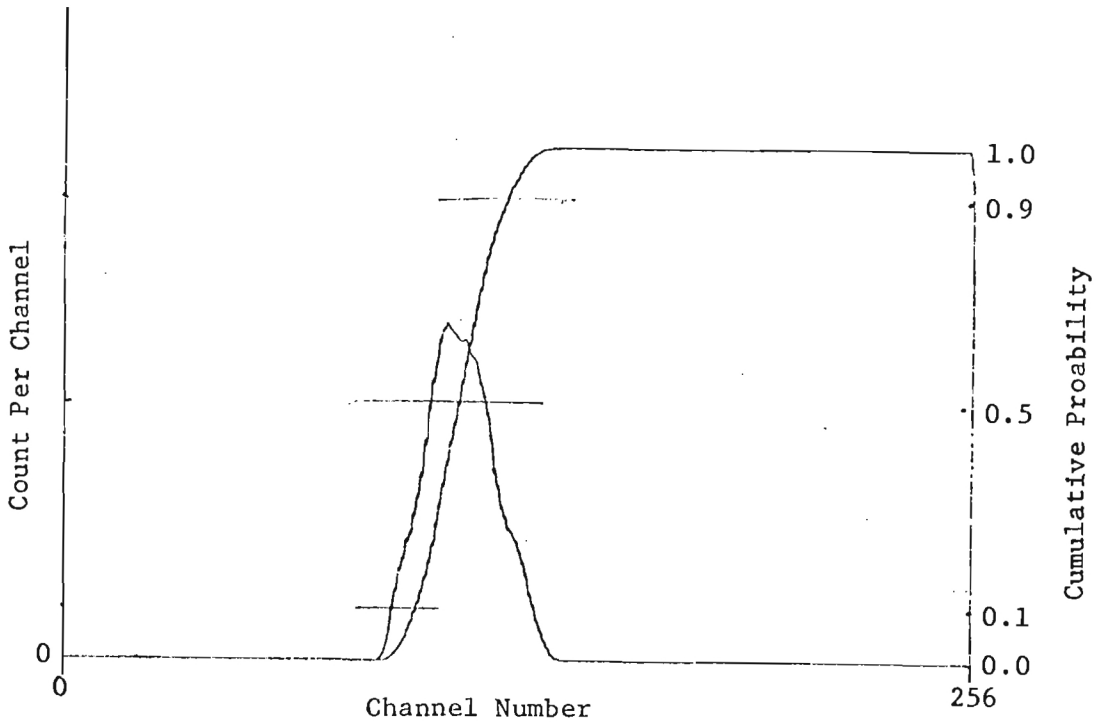
P 2 2 1970

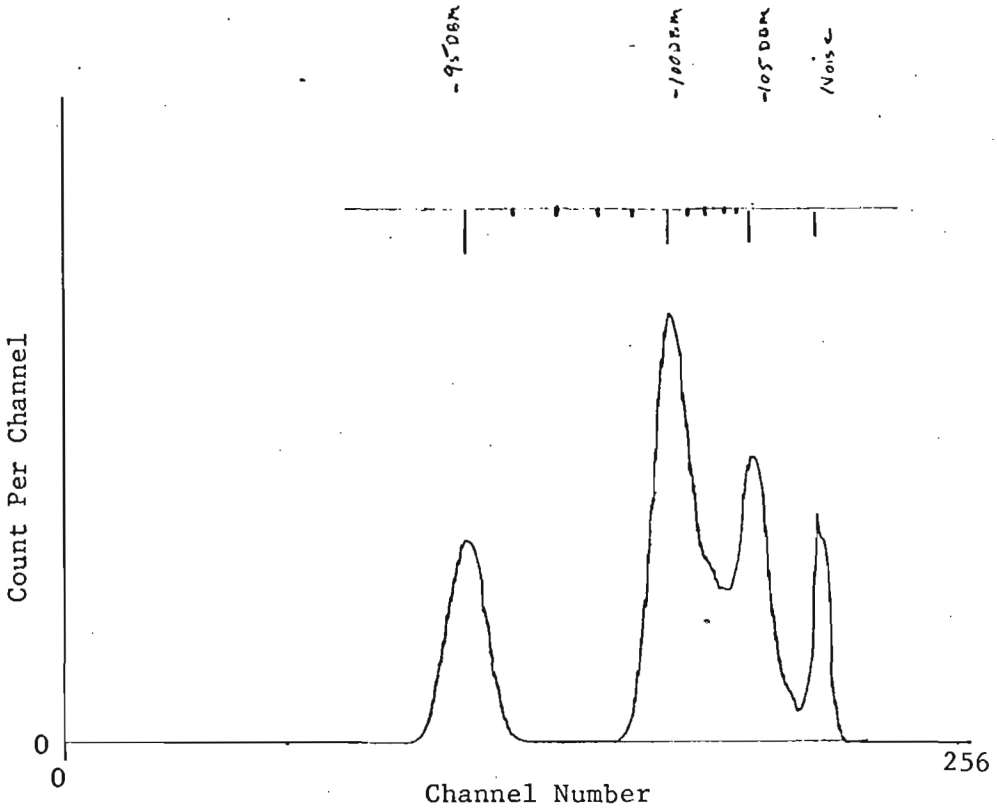
#3 Cal
30 MHz
42 DB inline

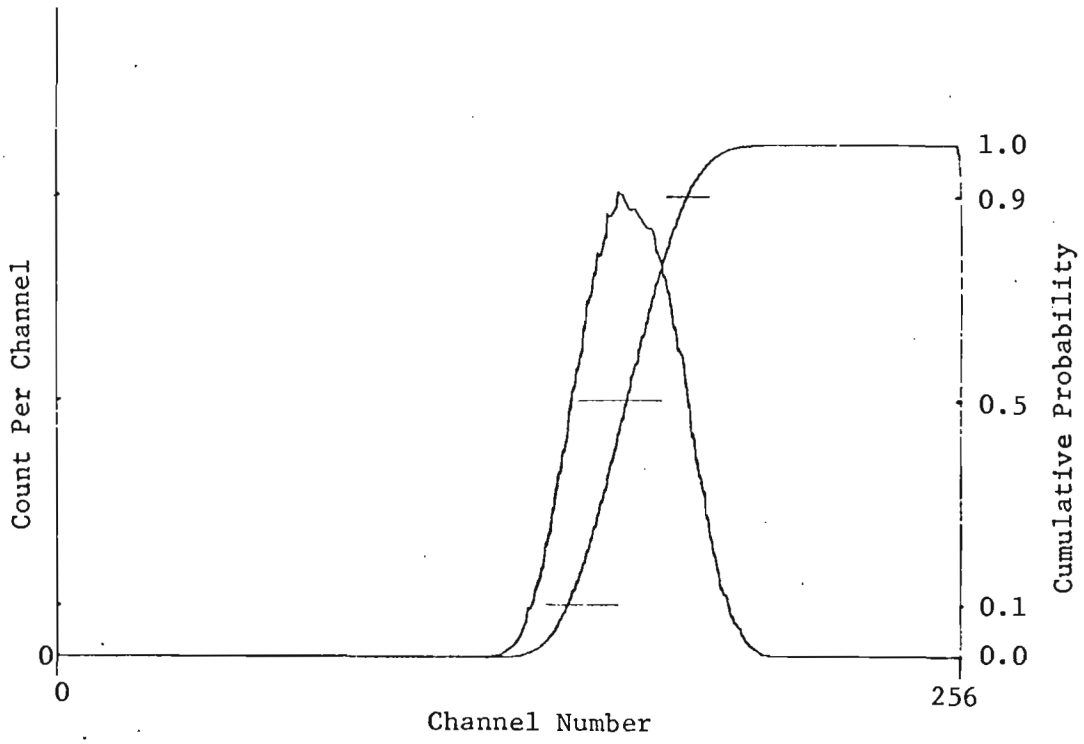


EP 2 2 1970

#2 [illegible]
30



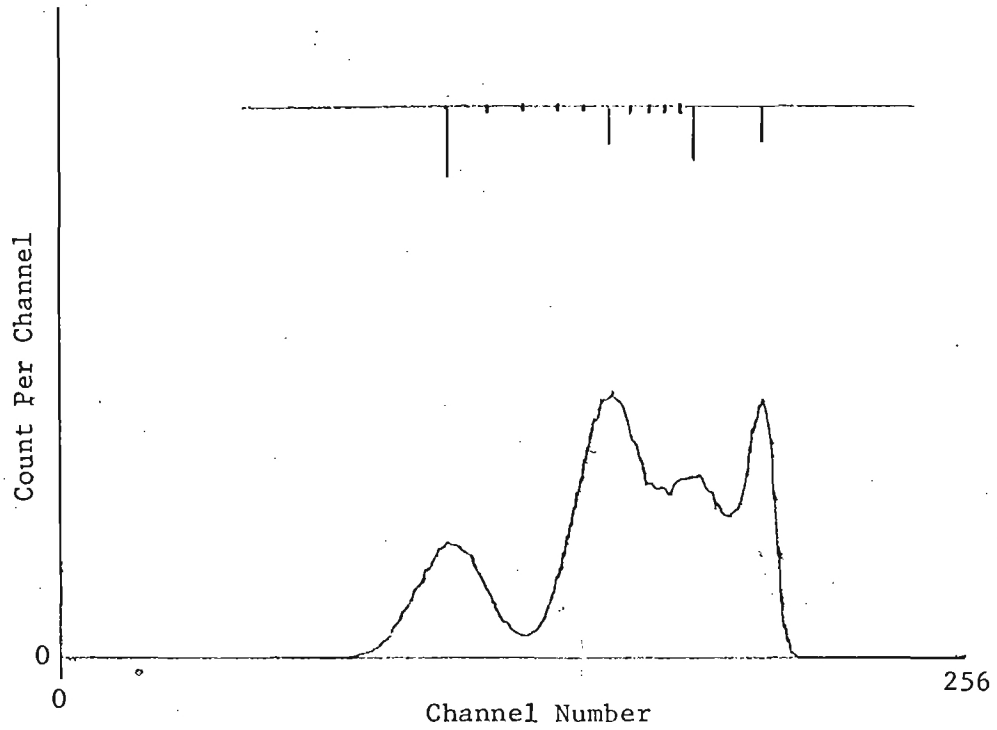

-95 DBM
-100 DBM
-105 DBM
Noise
Count Per Channel
0
0
256
Channel Number


Count Per Channel
0
0
256
Channel Number
1.0
0.9
0.5
0.1
0.0
Cumulative Probability

EP 22 1970

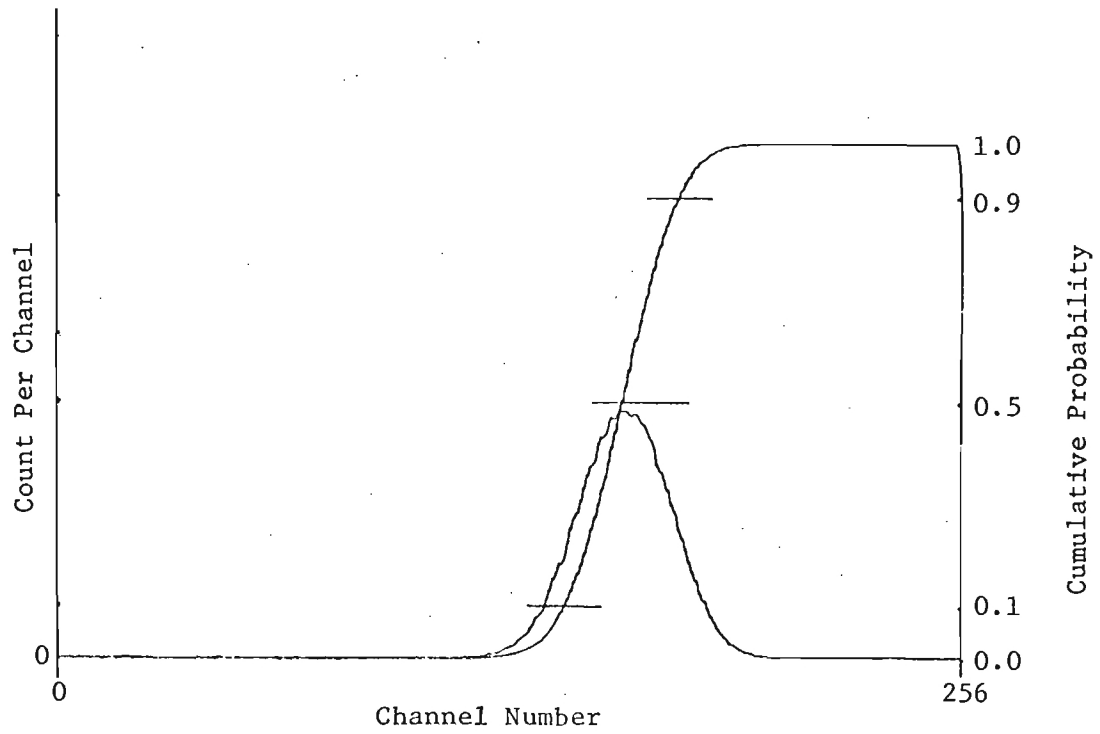
#3
4/2
Cal

-117 -122 -127 Noise

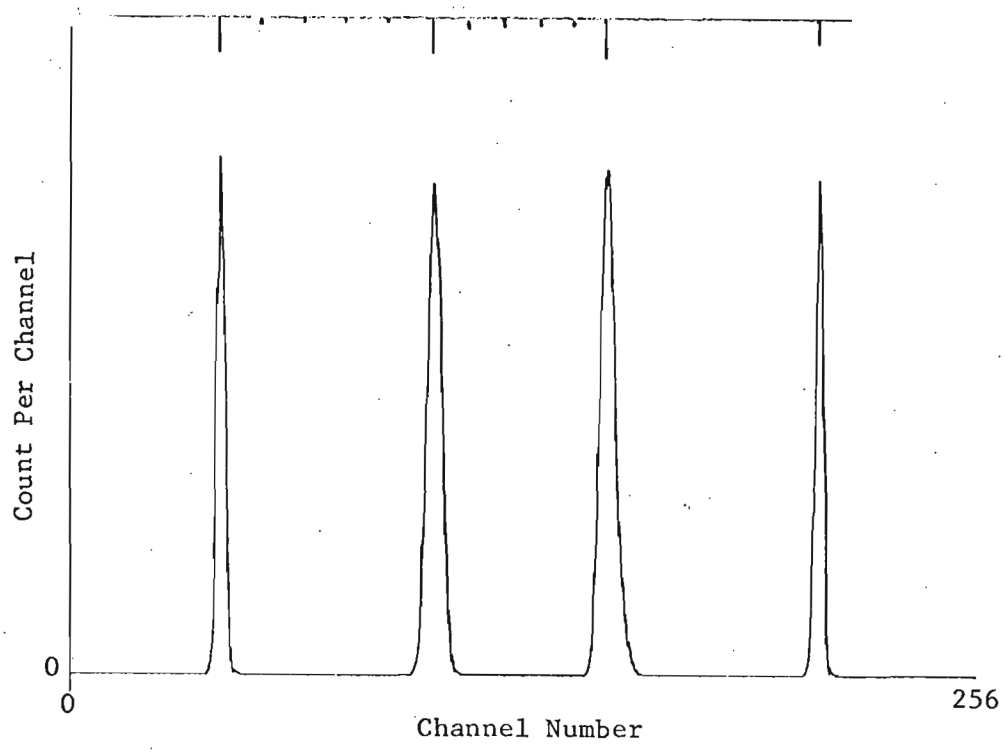


EP 22 1970

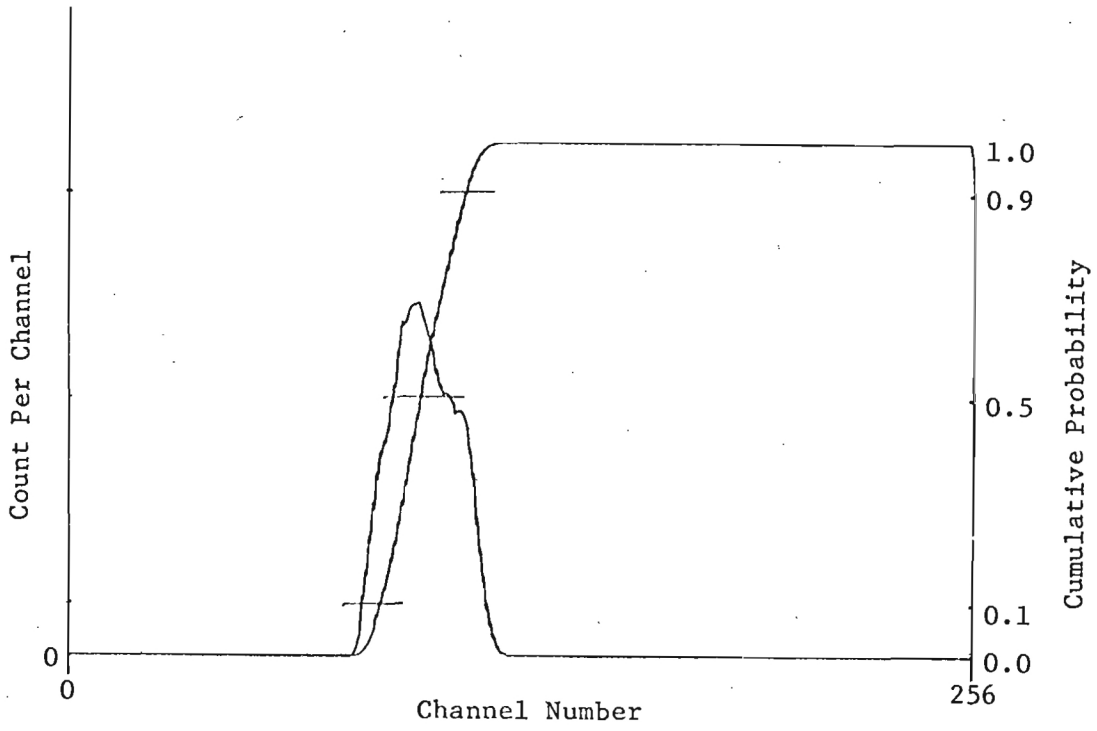
#2 weight 90
4/2

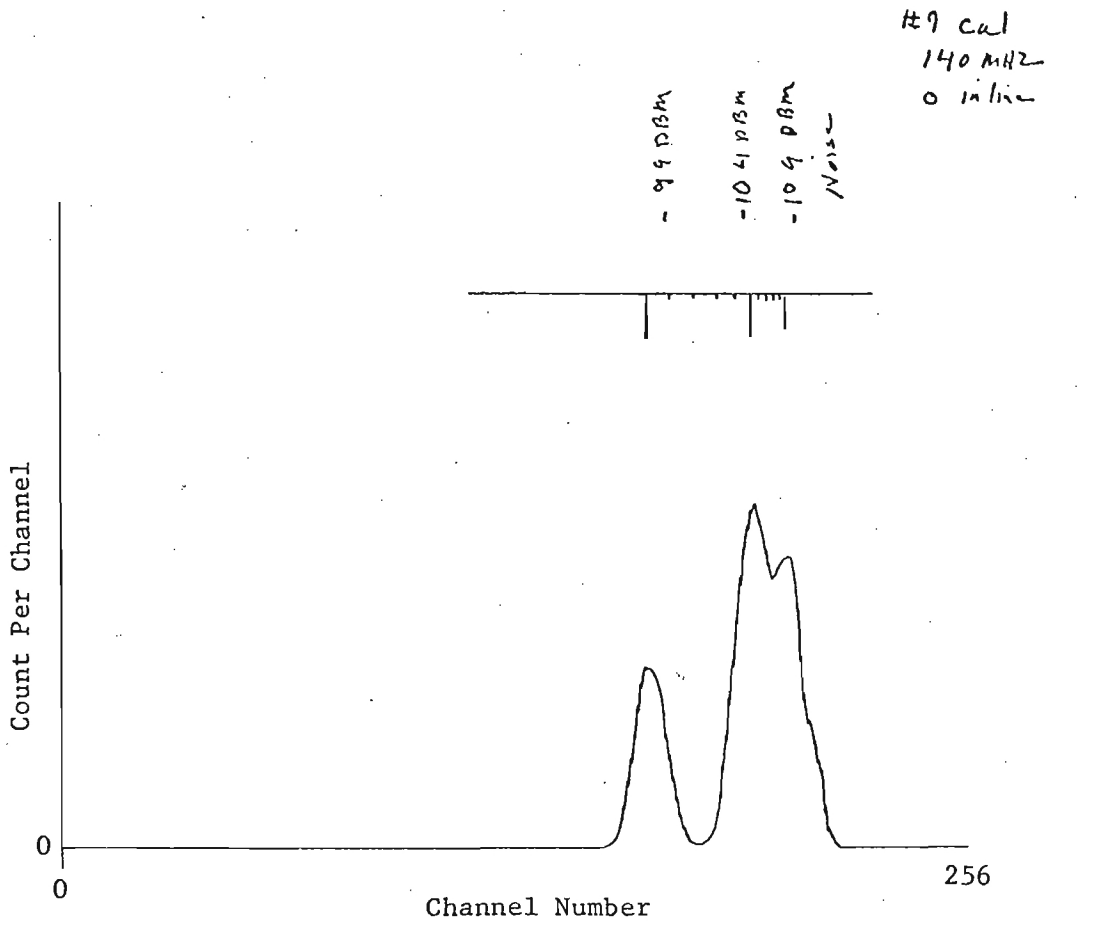


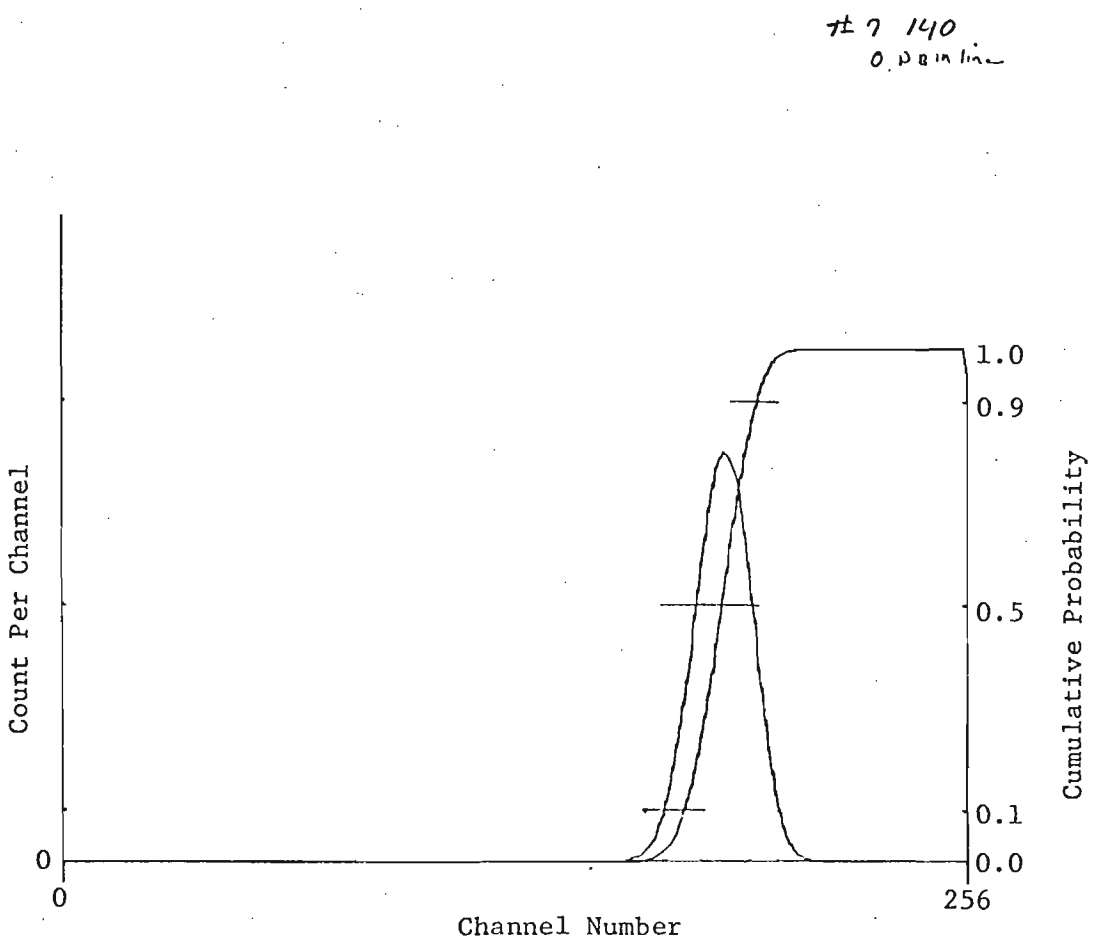
#9 cal
30 MHZ
-53 line
-58 sig



#9 30
33dB lineAR

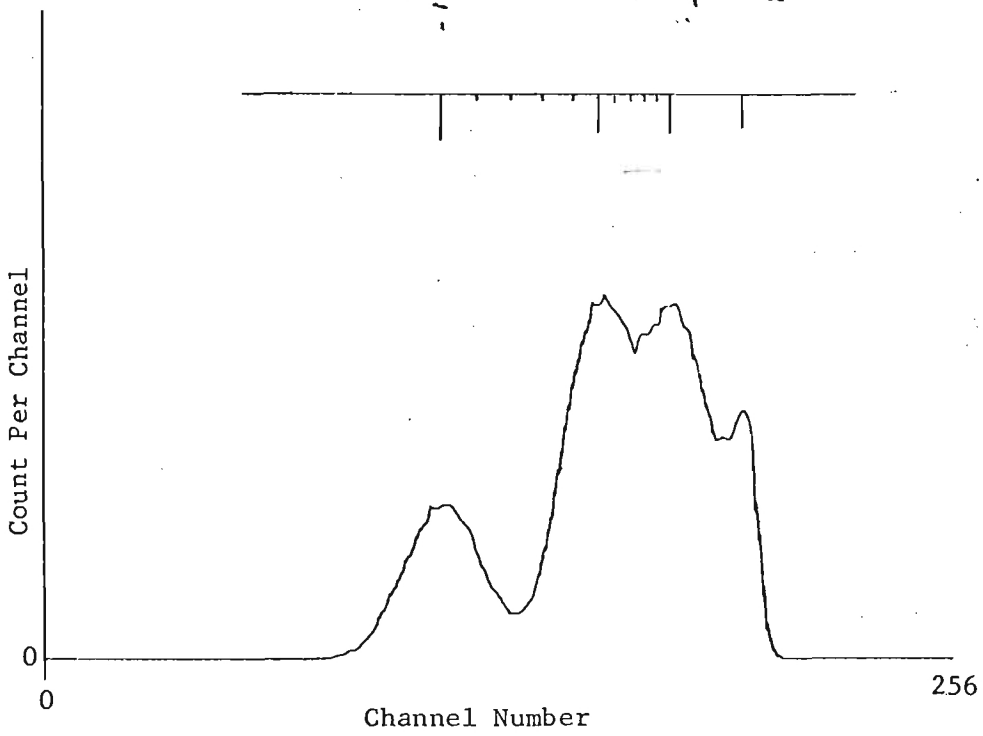



#9 cal
140 MHz
0 in line
-99 DBM
-104 DBM
-109 DBM
Noise
Count Per Channel
0
0
256
Channel Number


#7 140
0 DB in line
Count Per Channel
0
0
256
Channel Number
1.0
0.9
0.5
0.1
0.0
Cumulative Probability

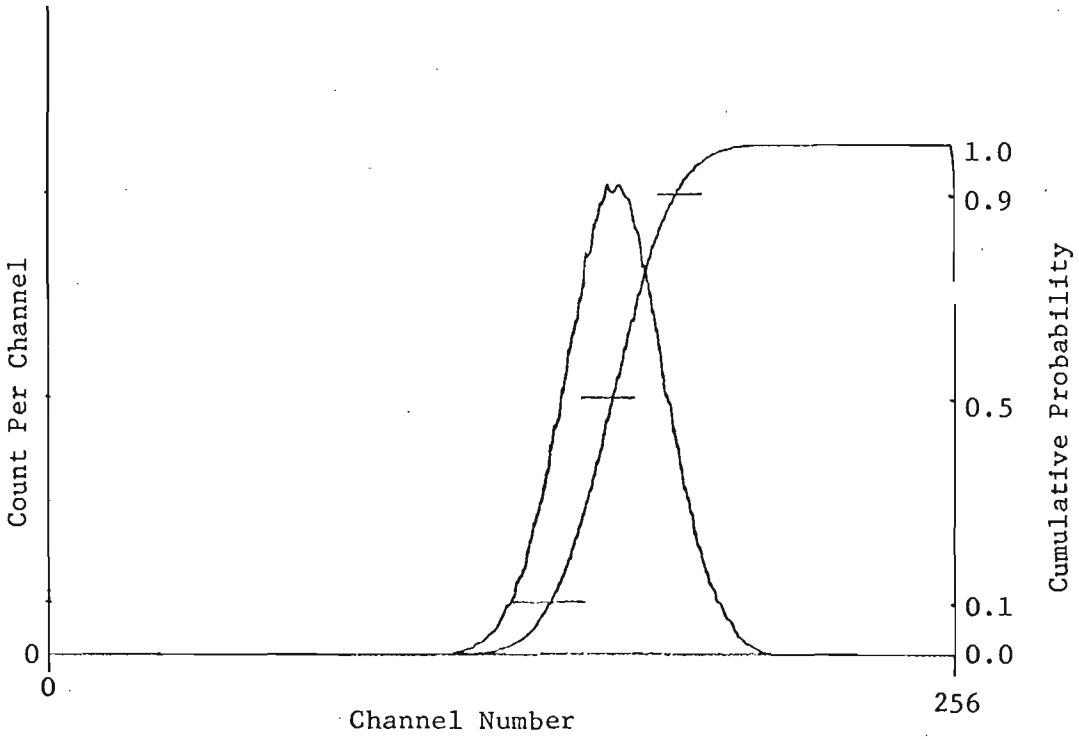
#7 Cal
412 MHz
18 DB in line

-119 DBM
-123 DBM
-128 DBM
Noise



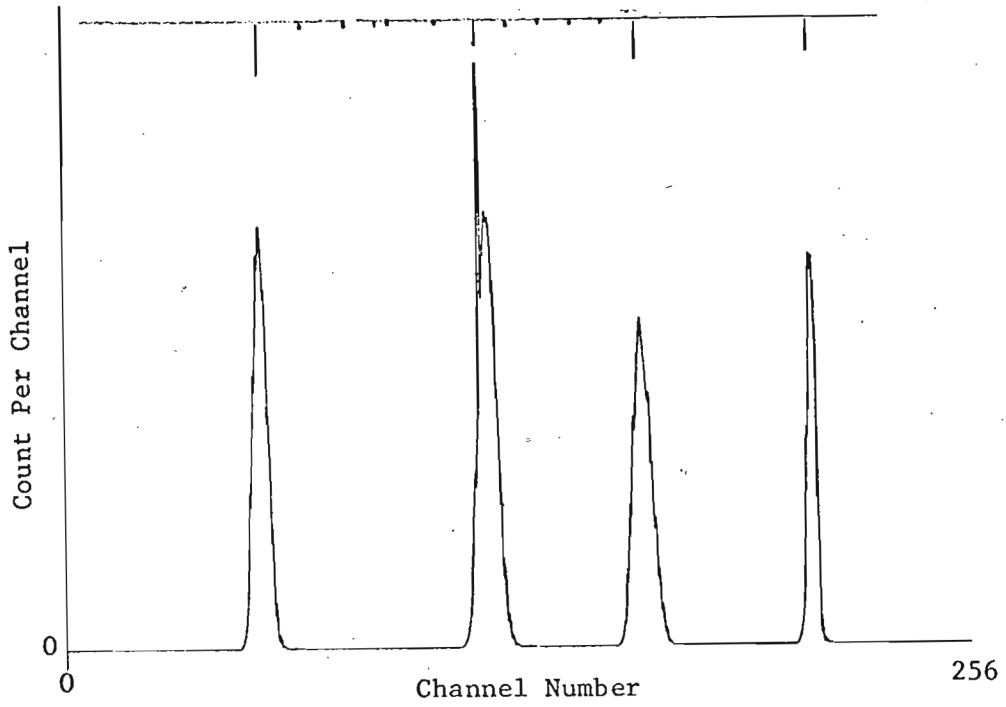
EP 22 1970

#7 412
18 DB
in line



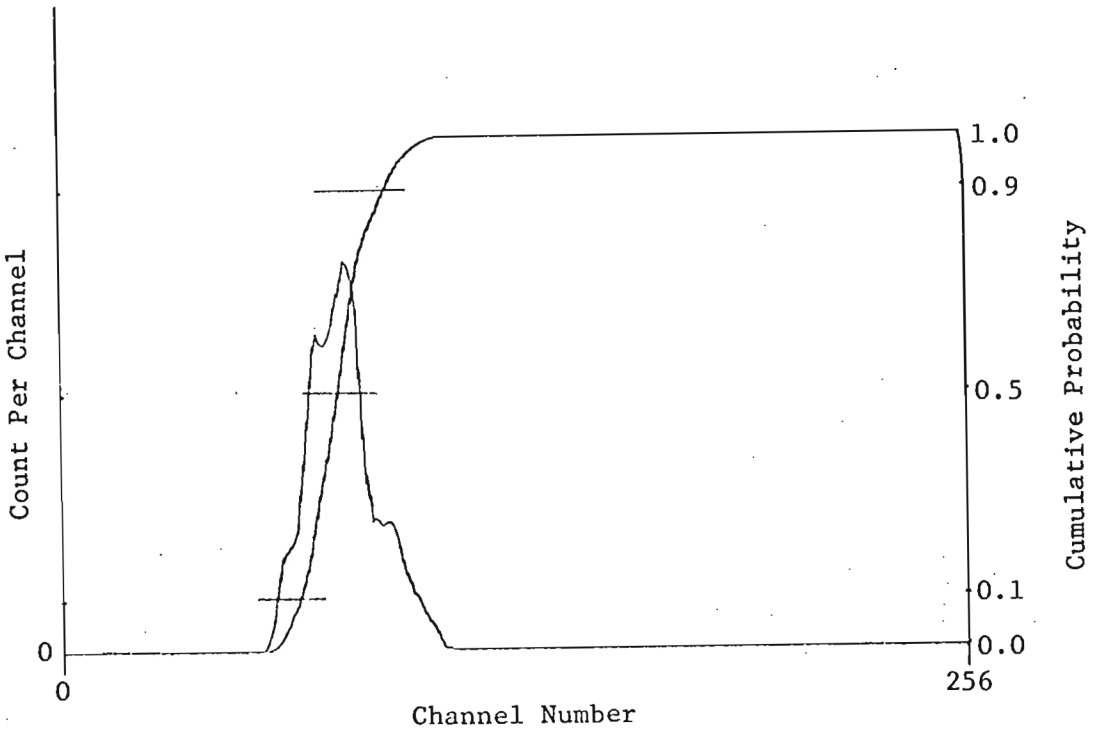
-87 dBm -92 dBm -97 dBm Noise

#8 30 MHz 40 PR line -52 dBm re.



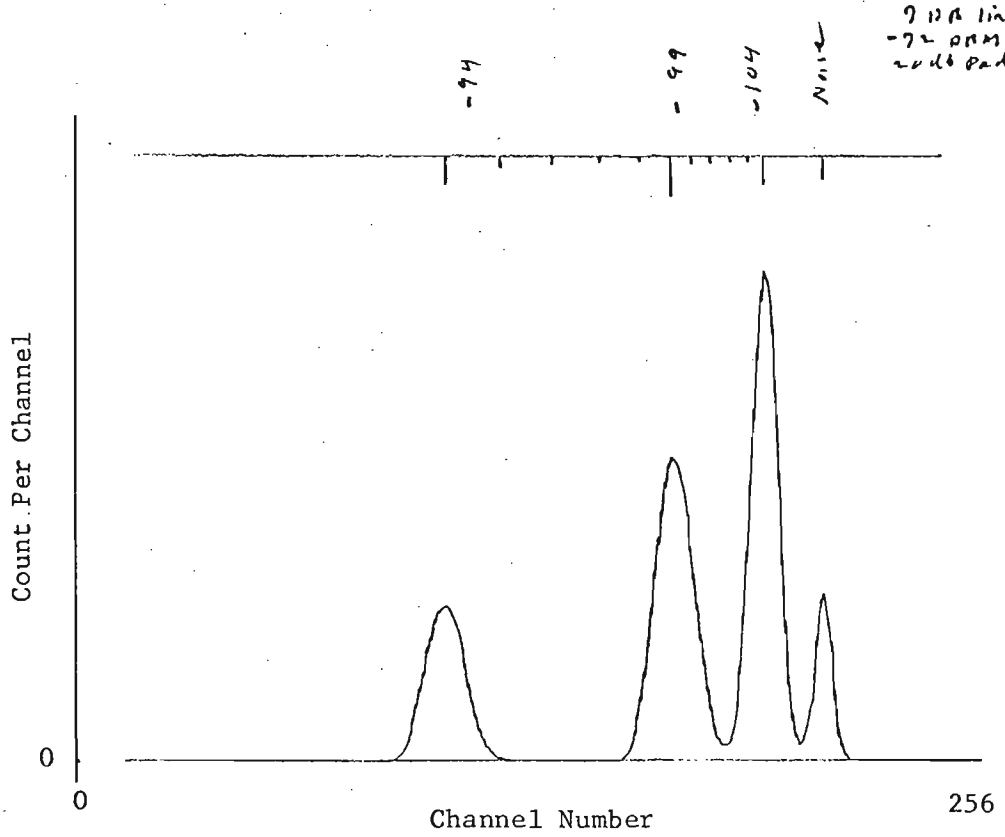
F 22 1970

30 MHz
40 PR in/nc



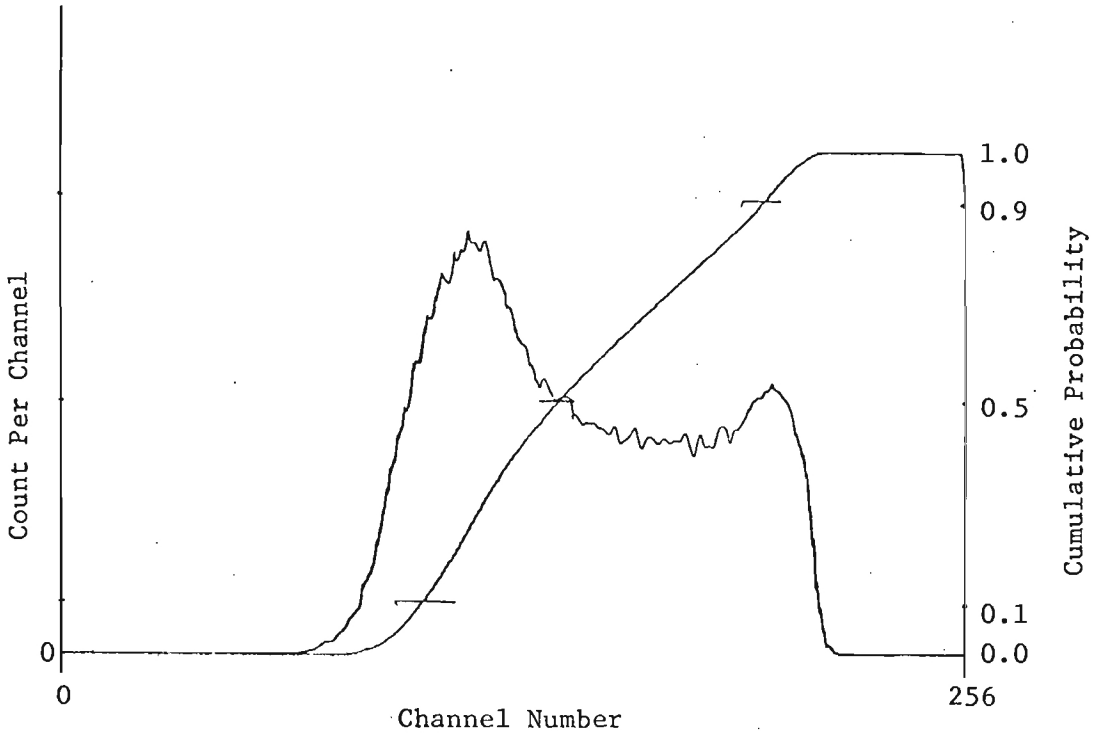
SEP 22 1970

#8
140 MHz
7 DB line
-72 PPM
2nd pad

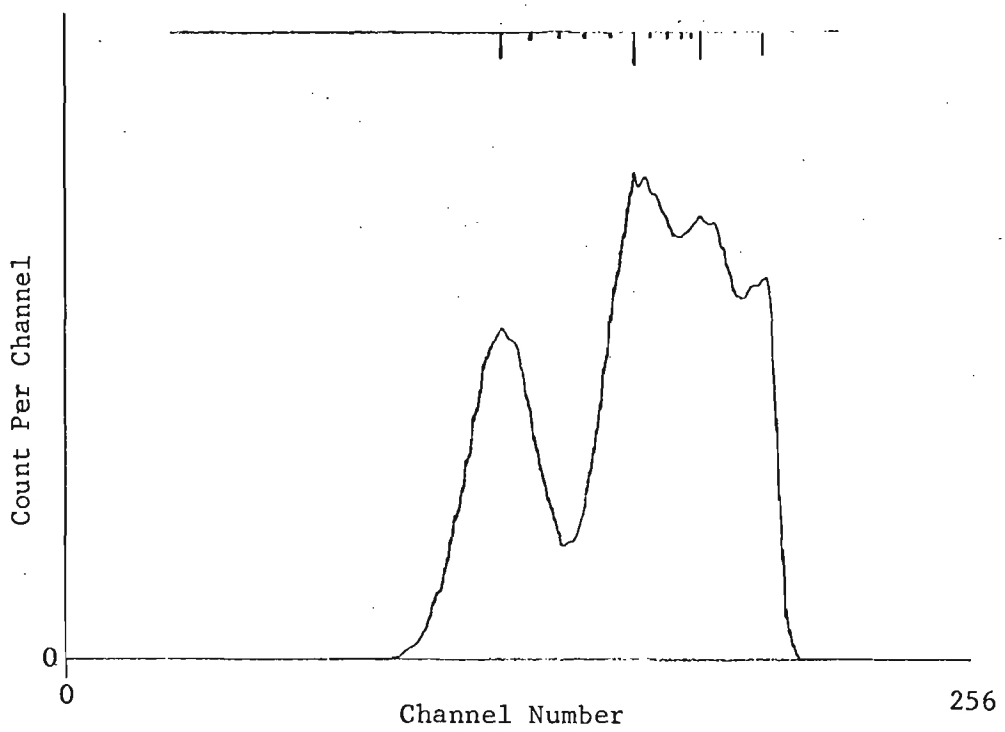


SEP 22 1970

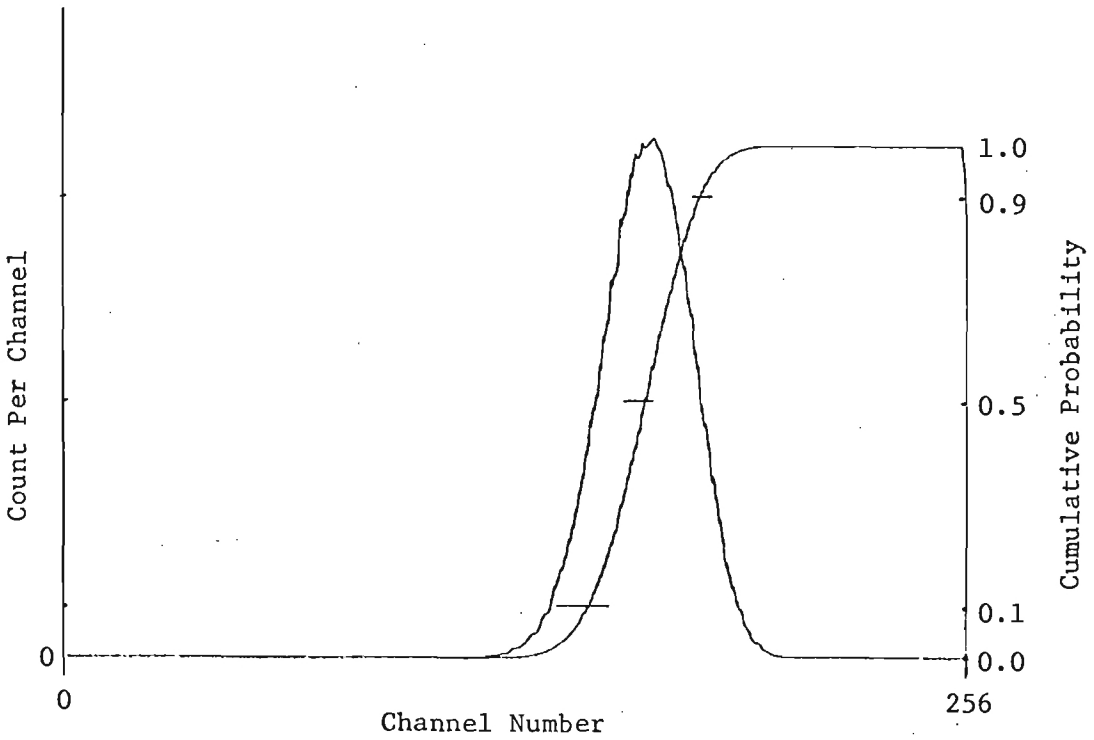
#8
140 MHz
7 DB in line



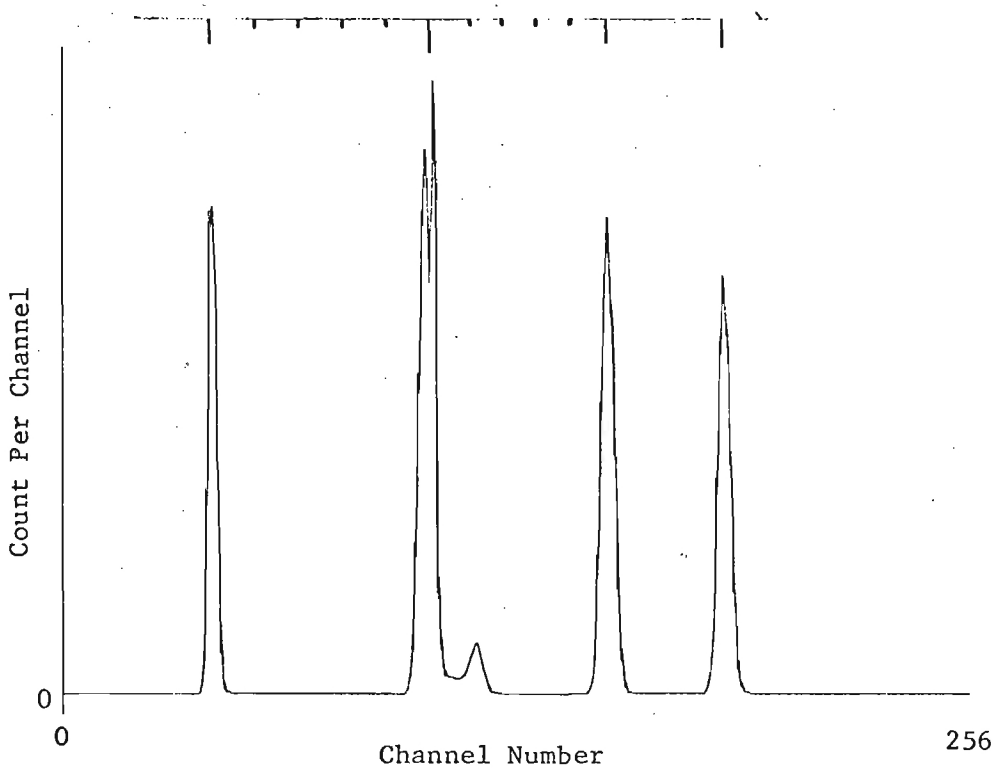
#8
4/2 cal
30 DB line
-36 DBm ?
20 DB Pad
-92 dbm
* see data sheet



#9
4/2
30 DB in line

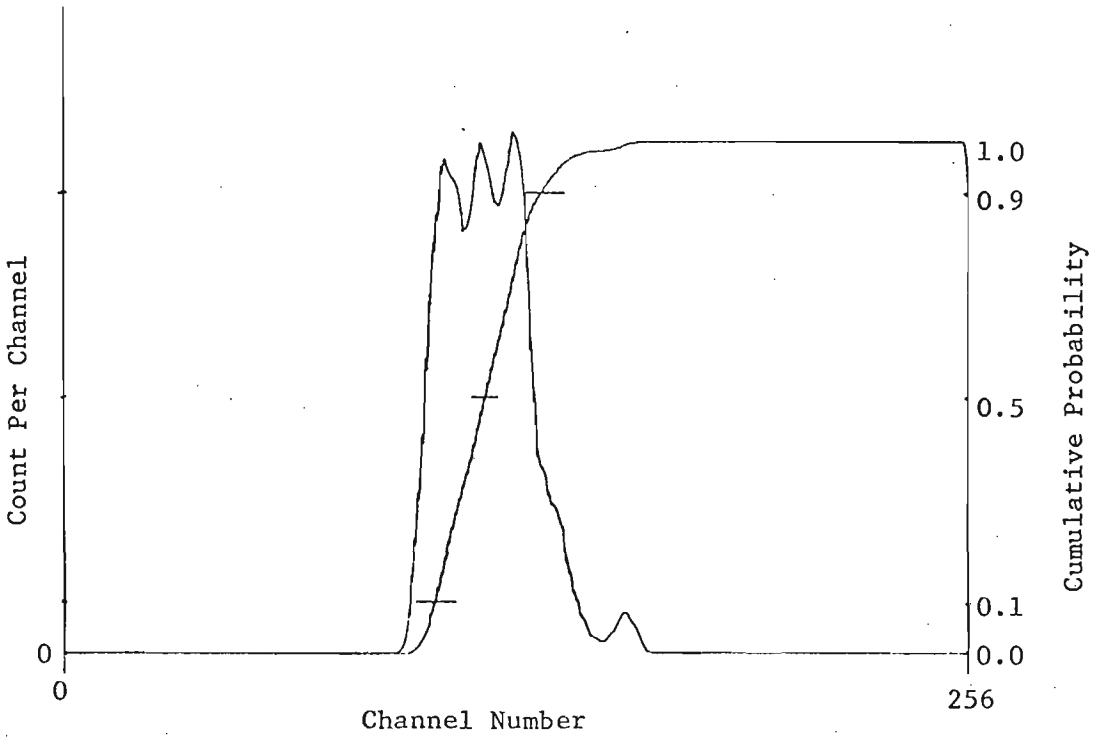


#11
30 MHz cal
-3 DB line
-38 DBM

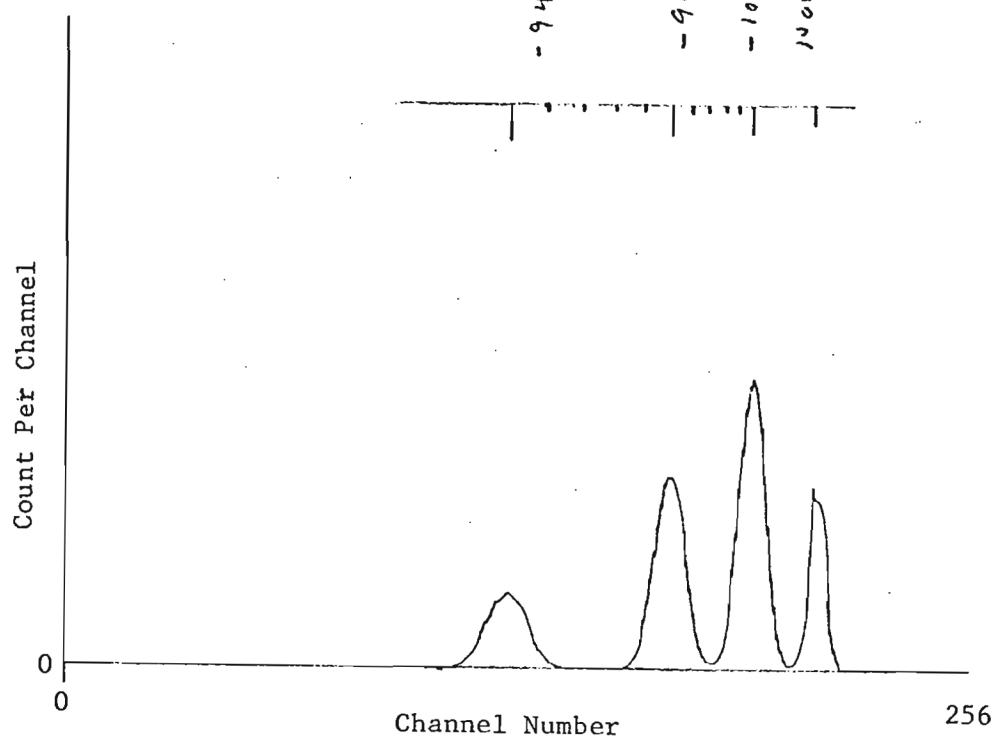


SEP 22 1970

#11
30 MHz
-3 DB in line



#11
140 MHZ Cal
19 DB linc
-60 DBm
20 DB Pad



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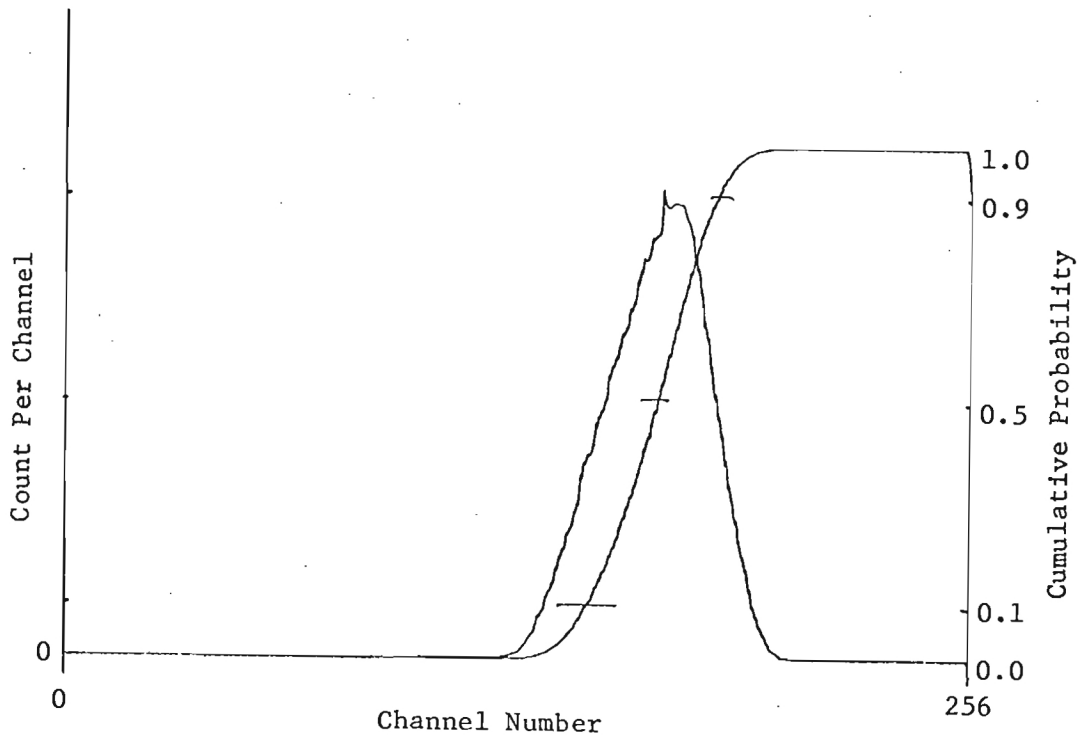
140 MHZ
19 DB in linc



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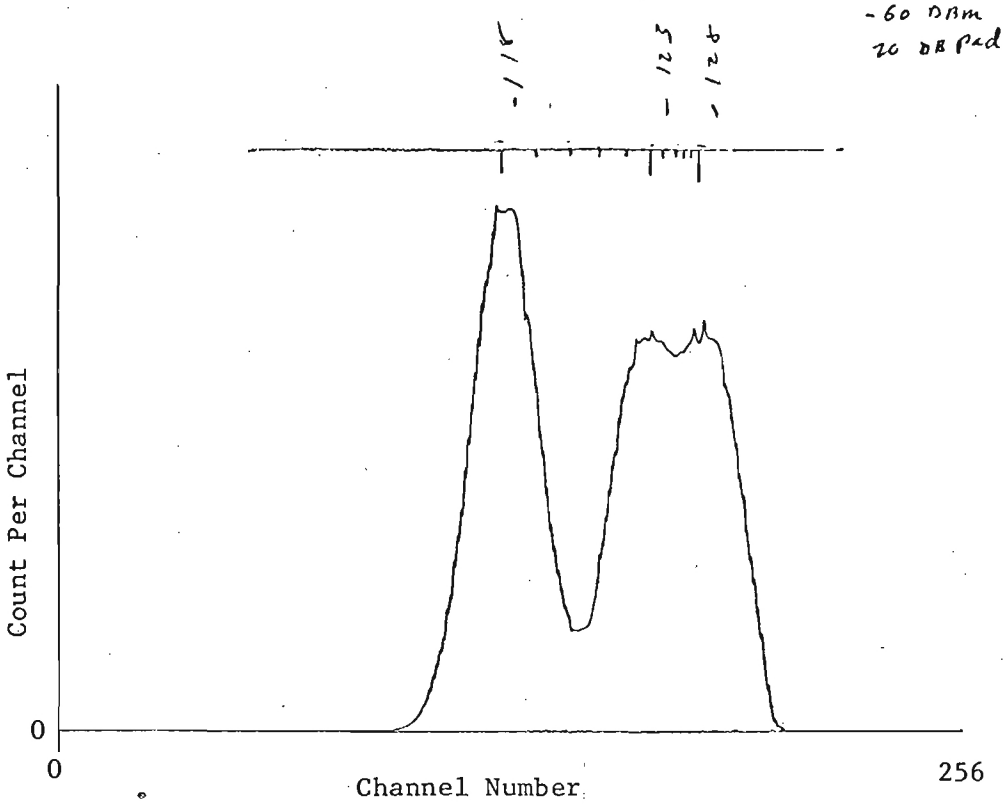
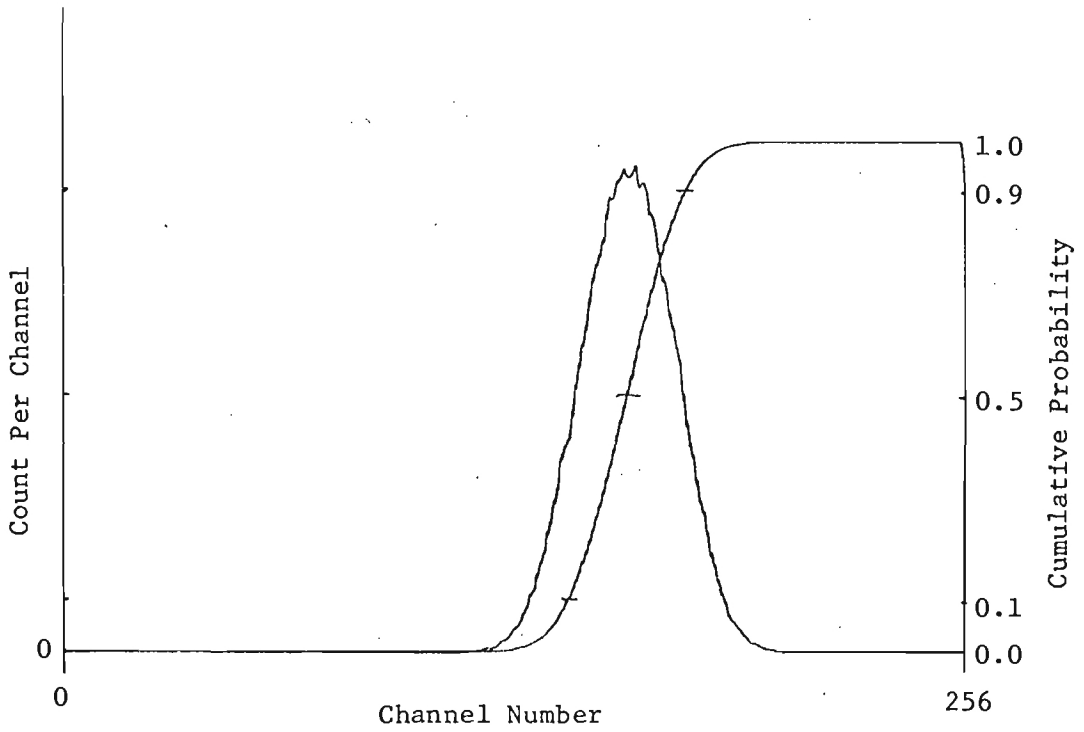
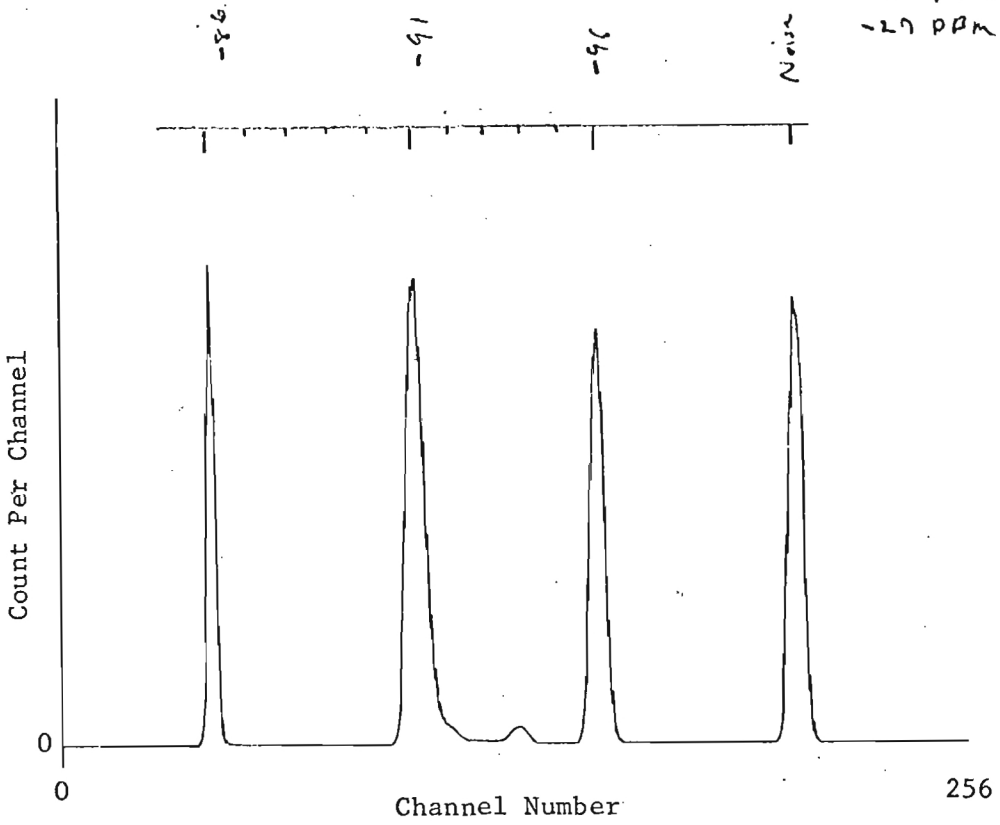
412 MHz Cal
43 DB line
-60 DBm
20 DB Pad



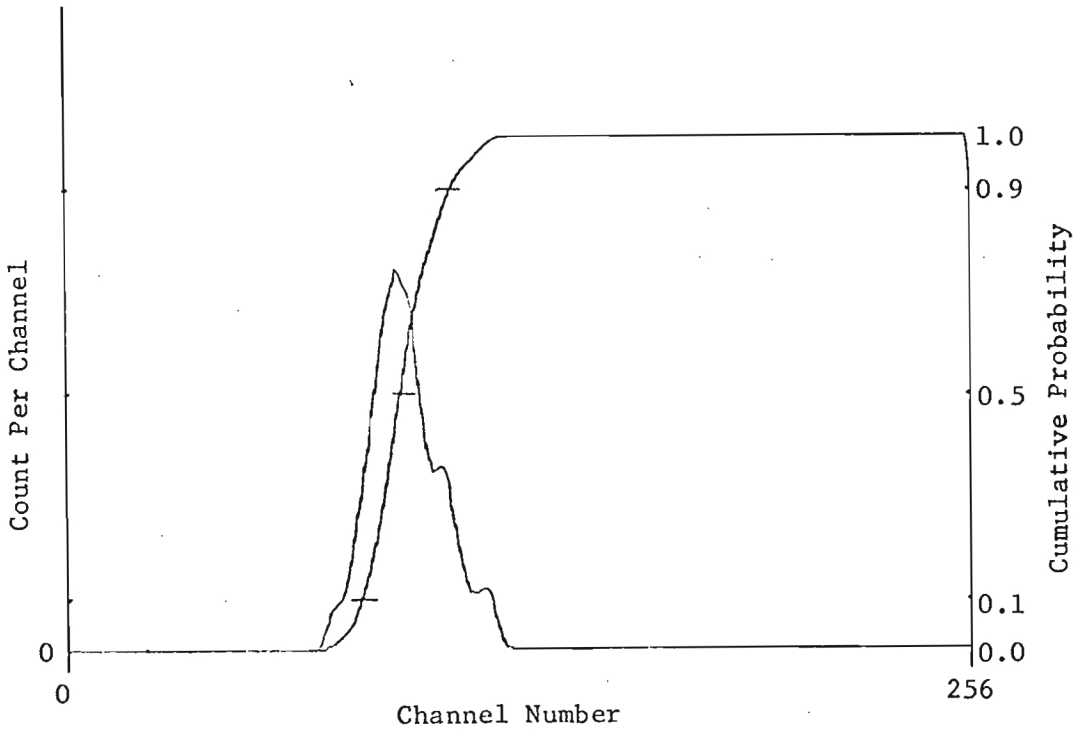
#11
412 MHz
-43 DB



#13
30 MHz Cal
64 DB in line
-27 DBM



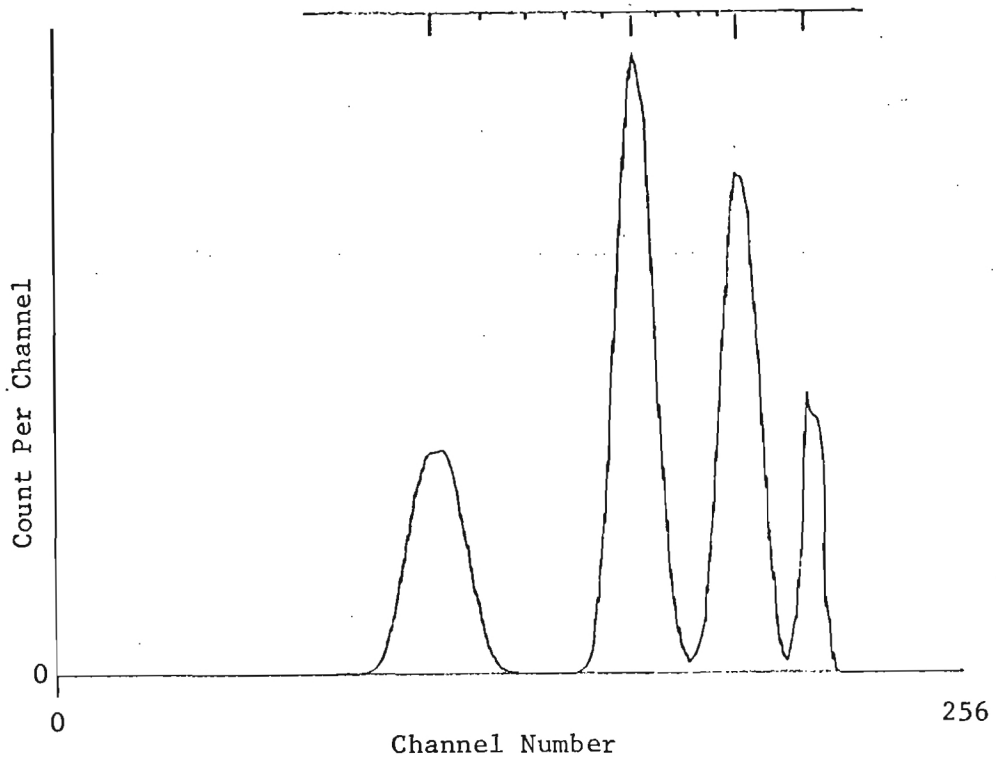
#13
30 MHz
-64 DB in line



P. 2 2 1370

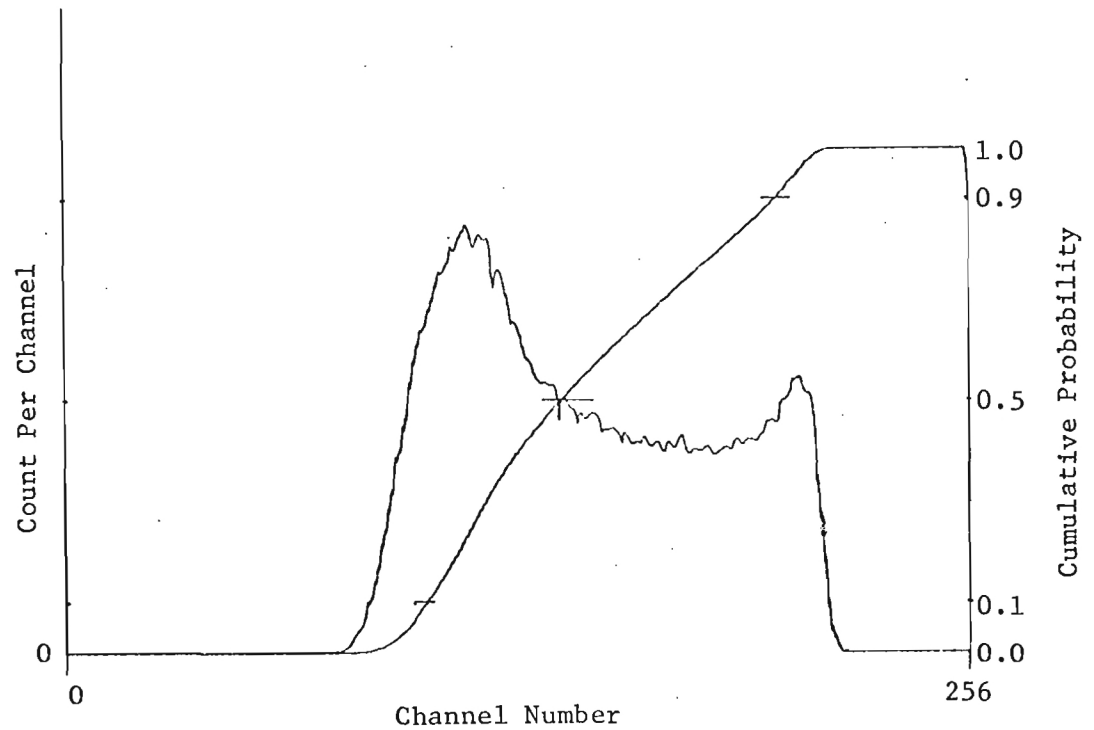
#13
140 MHz Cal
33 DB in line
-49 DBM
20 DB Pad

-95 DBM
-100 DBM
-105 DBM
Noise



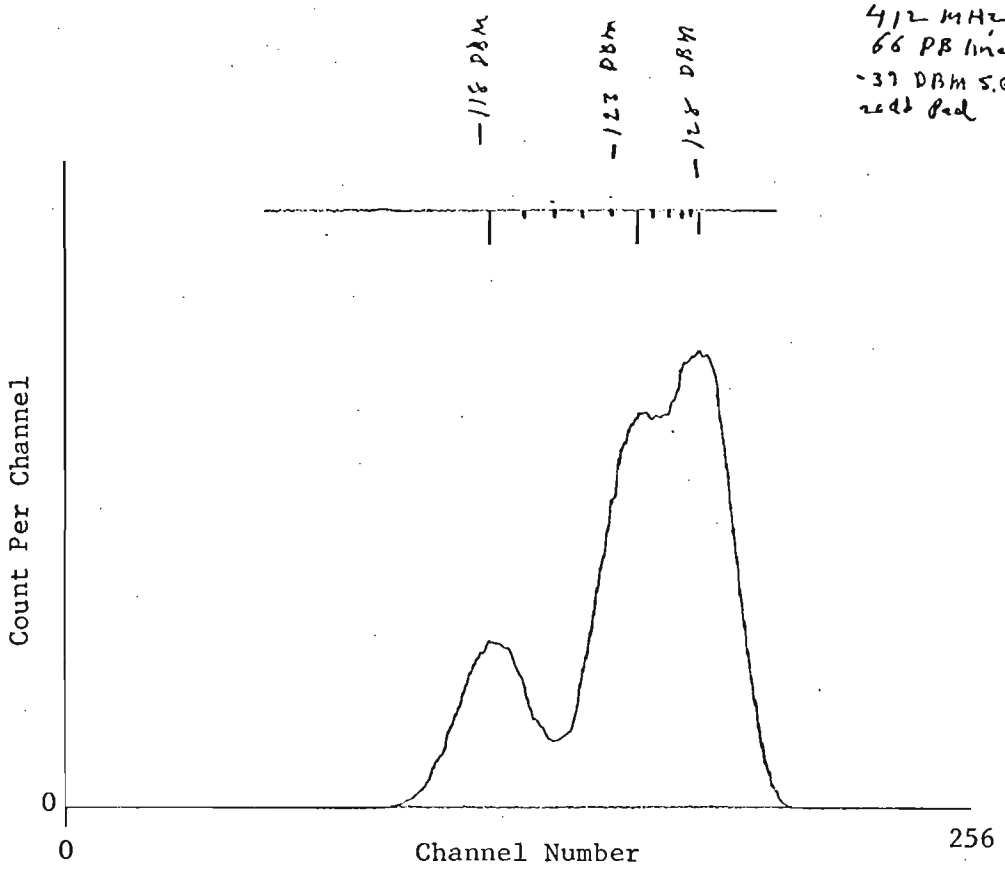
P 2 2 1370

#13
140 MHz
33 DB in line



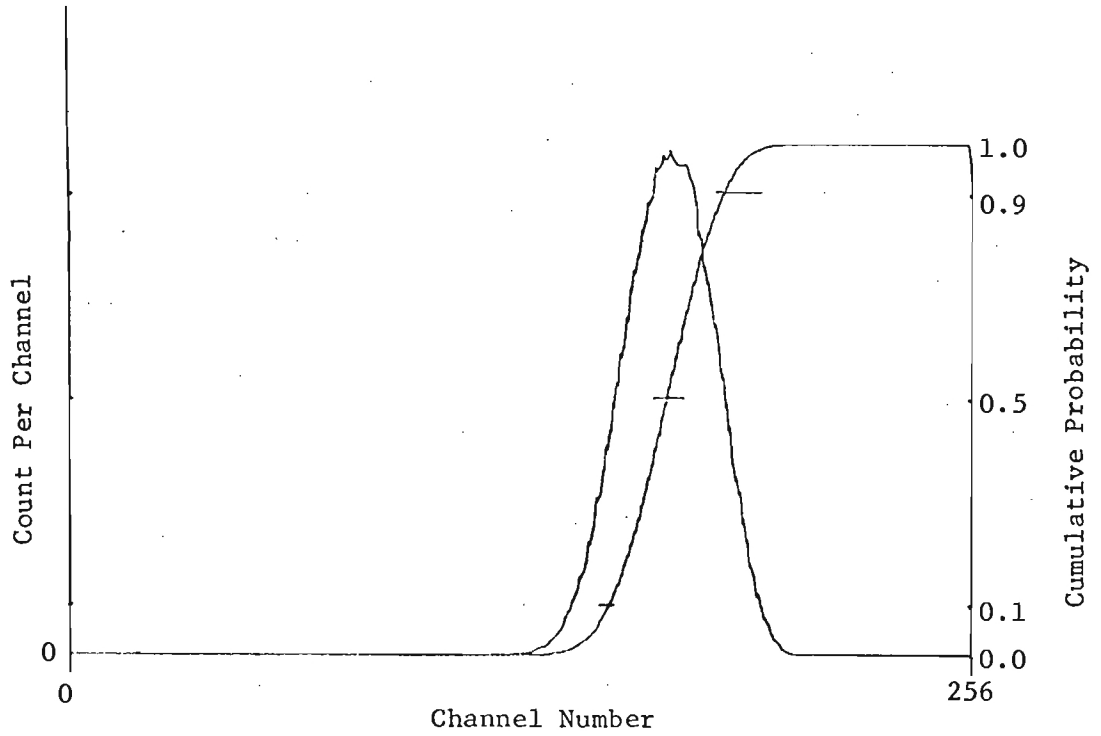
SEP 22 1970

#13
412 MHz
66 PB line
-37 DBM S.G.
2dB Pad



SEP 22 1970

#13
412 MHz
-66 in line



SIGNAL

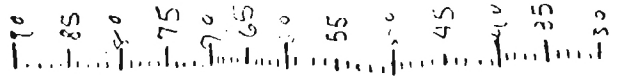
DISTRIBUTIONS

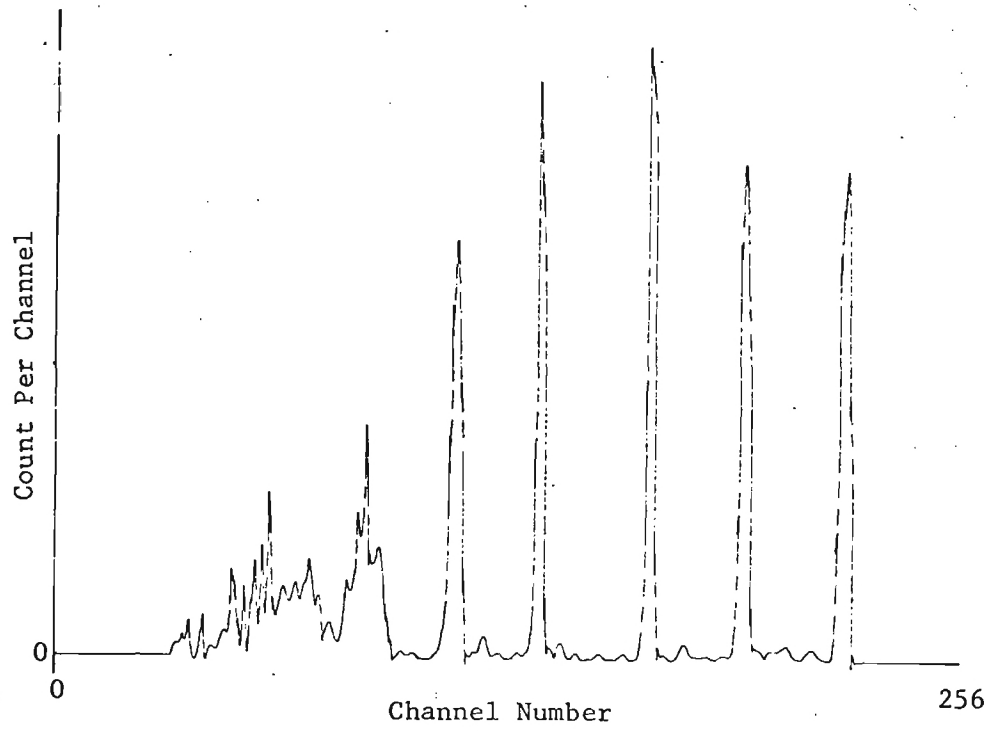
AT

27, 9400 MHz

SEP 22 1970

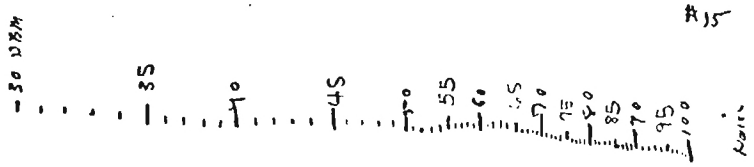
#1 22 Sept Radar Cal

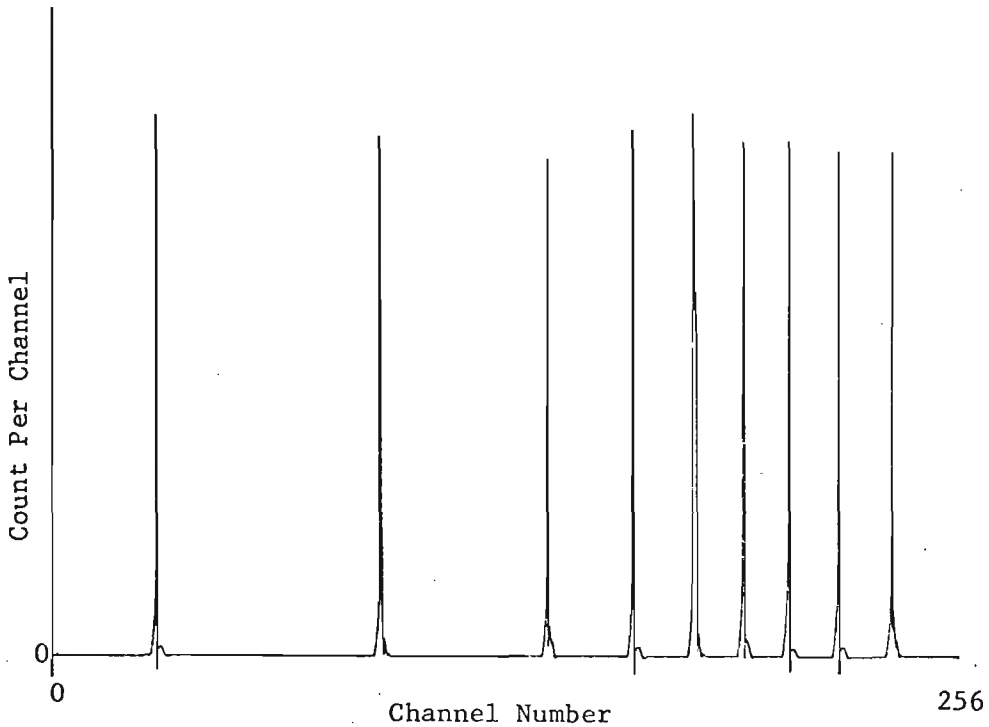


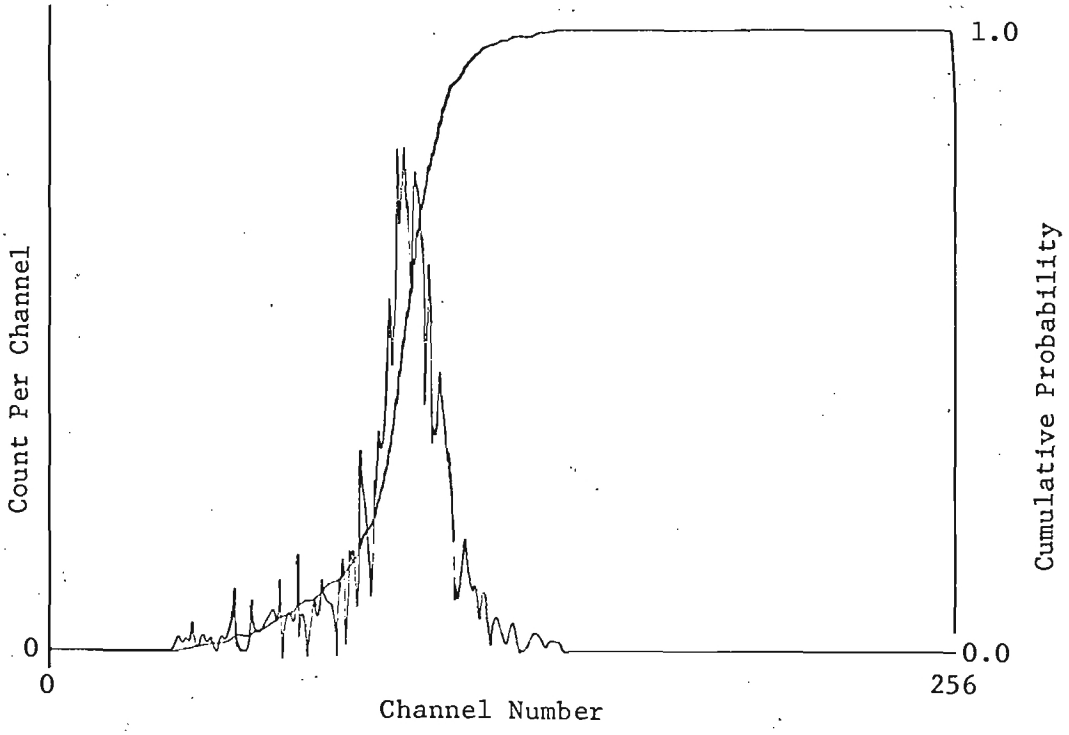


SEP 22 1970

#35 22 Sept 70
CB Calib

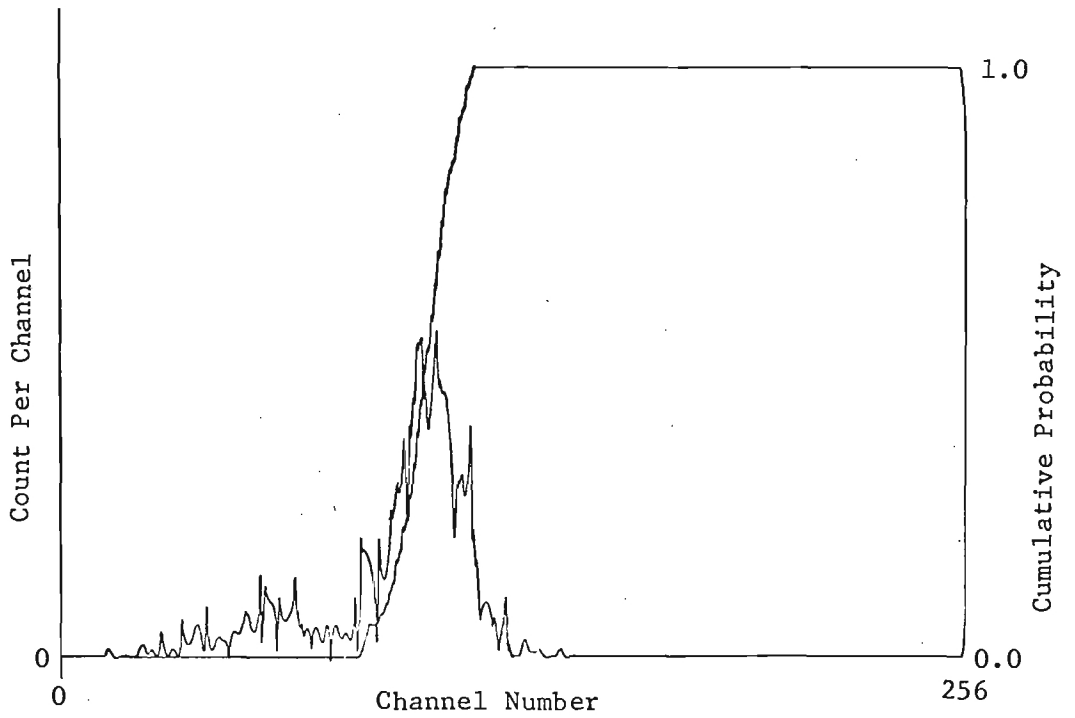






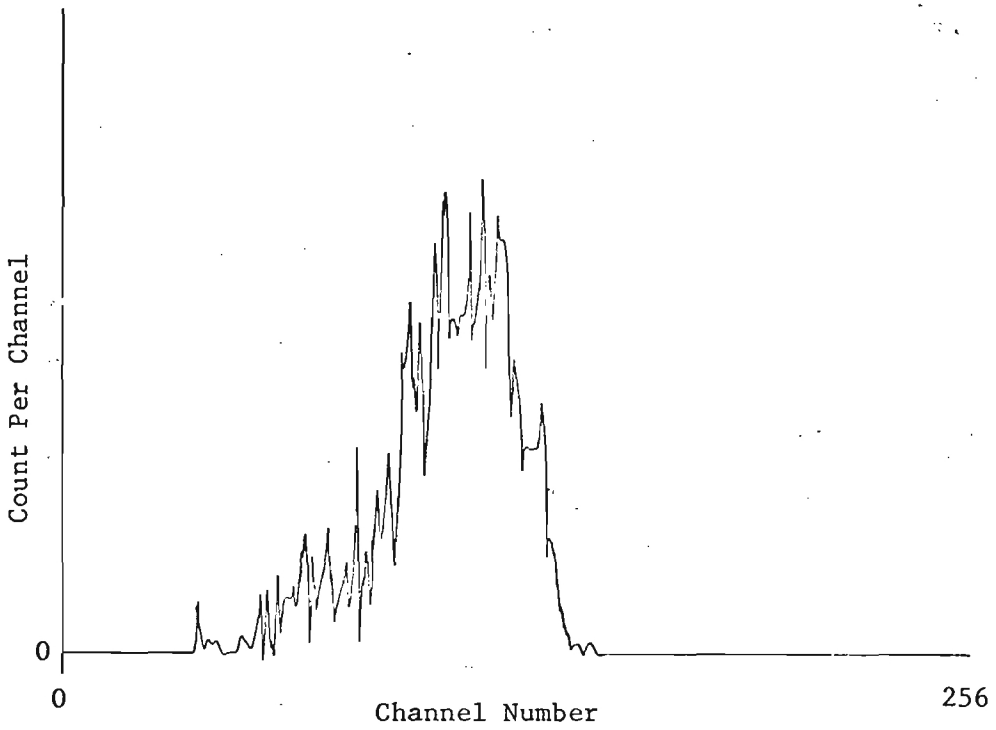
SEP 22 1970

#3 xBal 22 Sept 70



SEP 22 1970

#10
X Band
JCB



SEP 22 1970

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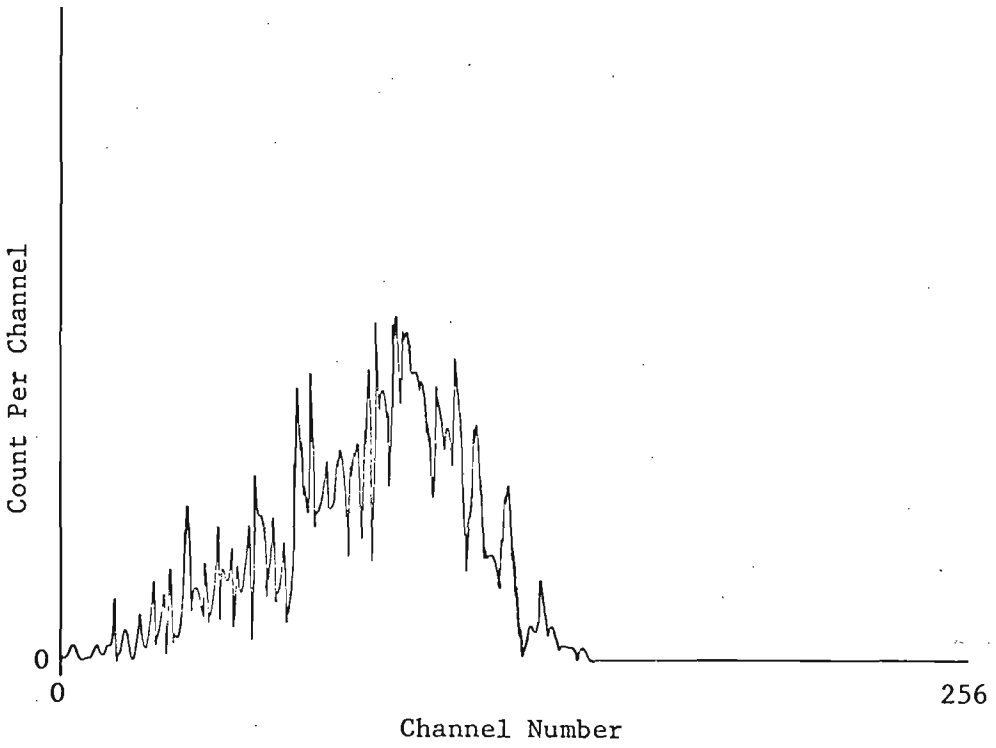
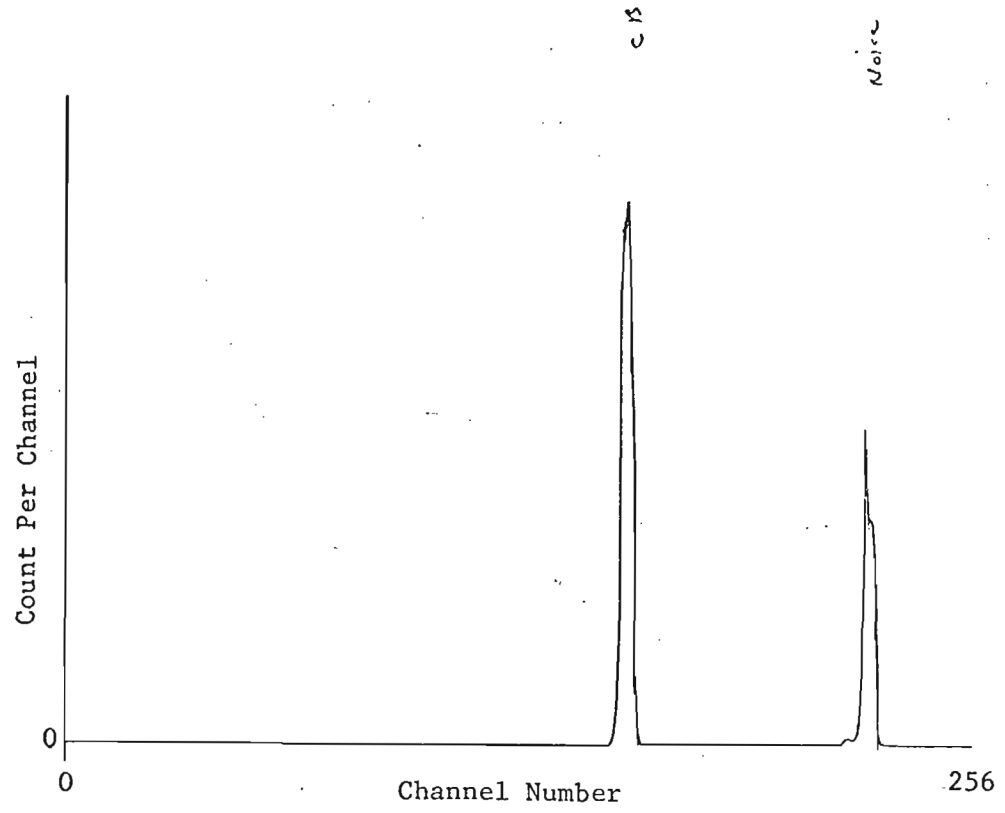
X Band
ECB



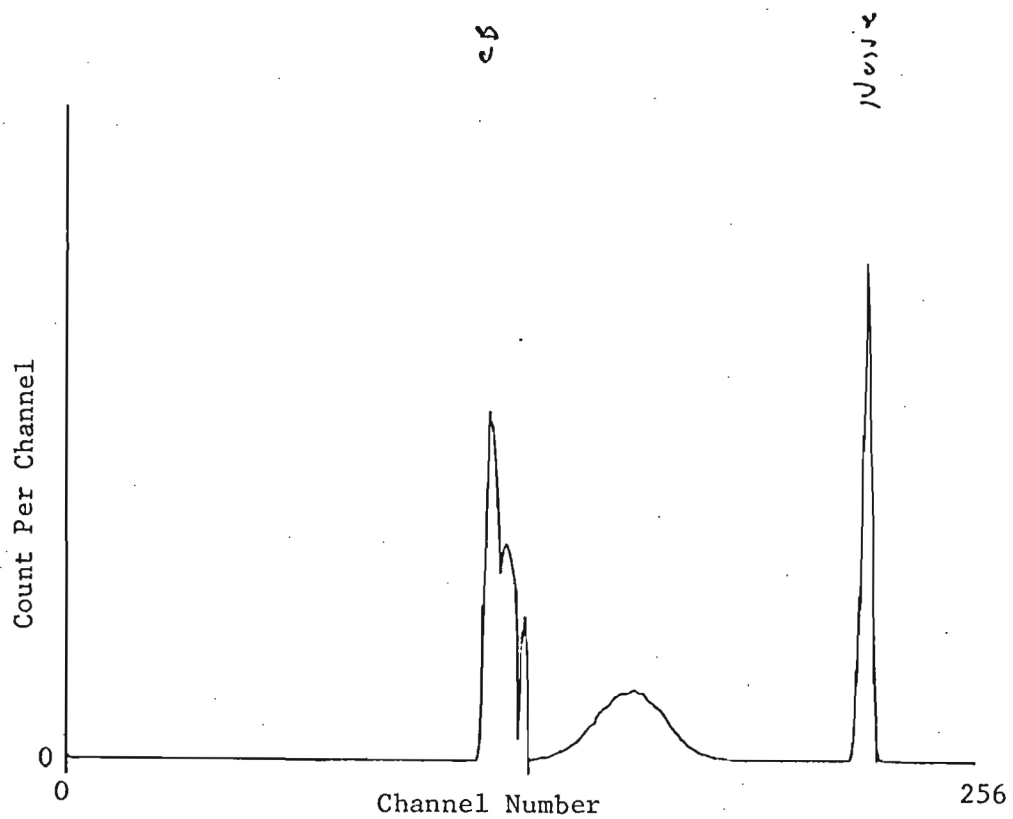
SEP 22 1970

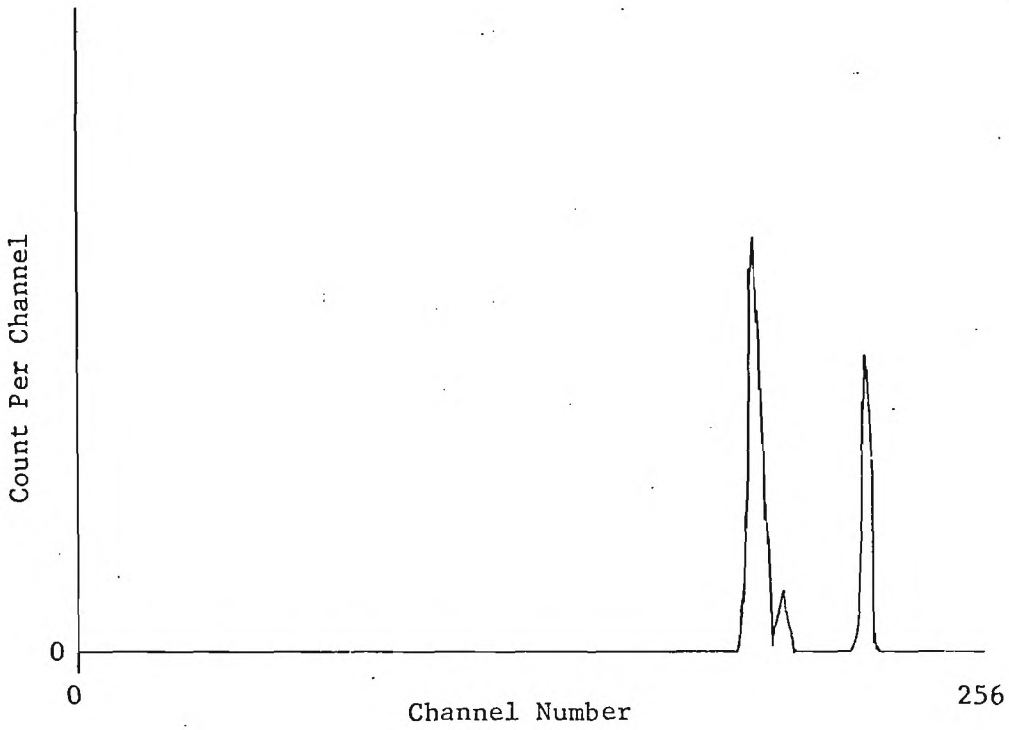
#9 CR Radio

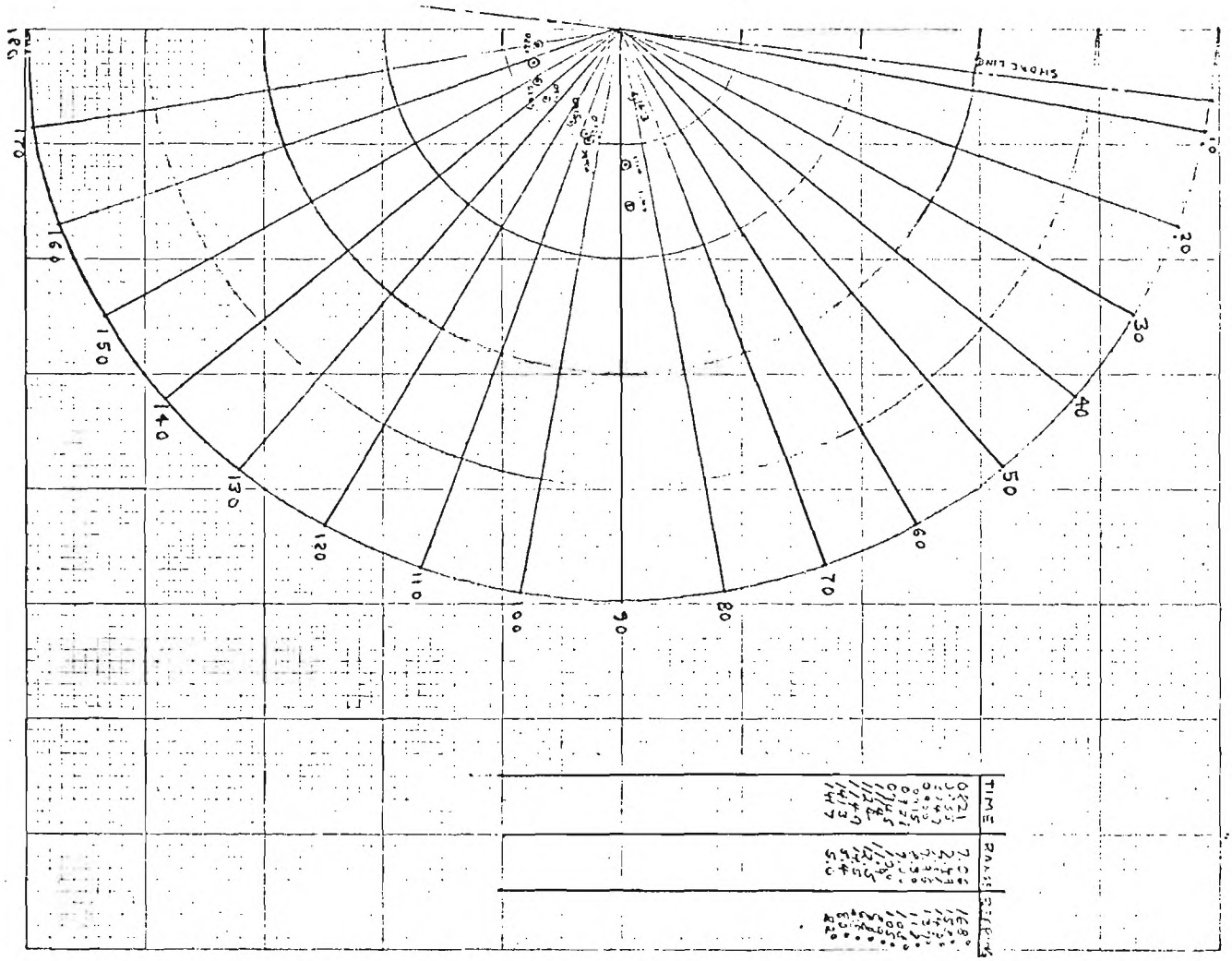


SEP 22 1970

#14 CB




Count Per Channel
0
0
256
Channel Number


SHORE LINE
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
TIME
RANGE
SIZE

ATTACHMENT II

Meteorological Data
and
Propagation Bibliography

The data assembled here are provided as partial documentation of the atmospheric propagation conditions during the series of experiments conducted at Boca Raton, Florida, in September 1970. The Bibliography is intended to provide a guide to some of the more applicable literature.

The data consist of twice-daily radiosonde readings obtained by the National Weather Service at Miami International Airport, daily weather summaries (both local and Weather Service, and graphs of refractivity data from the radiosonde flights. Detailed near-surface data are not currently available for the September period; however, efforts are still underway to obtain additional information.

Since the index of refraction of air is primarily a function of total pressure, temperature, and partial pressure of water vapor in the air, it is convenient to make use of an empirical relation for the index of refraction, n, in terms of these quantities in order to investigate the effects of refraction on radio propagation. A suitable empirical relation is (Reference 26)

$$n = 1 + \left(77.6 \frac{P}{T} + 3.73 \times 10^5 \frac{e}{T^2}\right) \times 10^{-6}, \qquad (1)$$

where P is the total pressure in millibars, e is the partial pressure of water vapor in millibars, and T is the absolute temperature in degrees Kelvin.

Although the second and third terms contribute only a few hundred parts per million to the refractive index, it is the variation of these terms with heights which brings about the "bending" of the radio waves. Thus, it is useful to define a quantity N, the refractivity, which is related to n by

$$N = (n-1) \times 10^6 \quad , \qquad (2)$$

or

$$N = 77.6 \frac{P}{T} + 3.73 \times 10^5 \frac{e}{T^2} \; . \qquad (3)$$

A number of variants to N have been used for various practical applications (Reference 26). One form of modified refractive index which has been widely used and is used here in Figure II-1 through II-3 is M, defined as

$$M = N_h + 0.048\ h \quad , \tag{4}$$

where N_h is the value of refractivity at any height h in feet. When the M-gradient is zero, the ray curvature is zero in the flat-earth case. This is another way of saying that when the N-gradient is minus 48 units per 1000 feet, the ray has the same curvature as the earth.

Another variant which is often used is the B-modification, where B is defined as

$$B = N_h + 0.012\ h \quad , \tag{5}$$

where N_h and h are as defined above. This modification is used to illustrate departures from a "standard" atmosphere, and this is a logical consequence of the four-thirds earth radius concept of the standard atmosphere definition.

The radiosonde data of Table II-1 were reduced to N-units by the use of Equation 3 and tables from the Handbook of Chemistry and Physics (Chemical Rubber Corporation, Edition 49, 1968) and the Smithsonian Meteorological Tables, Sixth Revised Edition, Robert J. List (Publication 4014, Smithsonian Institution, Washington, D.C.). The data are plotted in Figures II-1A, II-2, and II-3 as M-units in order to explore the possibility of ducting levels (i.e., vertical lines). The graph in Figure II-4 is reproduced from Reference 26 and makes use of B-units. The lines shown in Figure II-1B are presented as graphical aids to the interpretation of the radiosonde data in the other figures. The labels on the lines of Figure II-1B show the effective earth radii which would result from M-profiles of the indicated slopes. These slopes should be interpreted as showing a general trend rather than an actual height dependence of M.

The M-profiles shown in Figures II-1A, II-2, and II-3 are believed to be generally descriptive of the elevated atmospheric conditions which actually existed at the Boca Raton Field Site during the measurement period. The surface point, however, probably does not accurately represent the surface conditions at the Field Site, since these data were taken inland near the Miami airport. Inspection of Figure II-4 shows that the region of interest extends to heights of several hundred meters; thus, more information is needed to actually define the near-surface refractivity. The data in Table II-2 are included to provide some information about the air-water interface which may be of value in defining the lower region. Reference 26 provides an approach to defining the height and strength of the surface evaporation layer from knowledge of air-water temperature difference and wind speed. Another possibility would be to refine the surface point of the M-profiles with the aid of the data of Table II-2. Neither of these approaches has been investigated.

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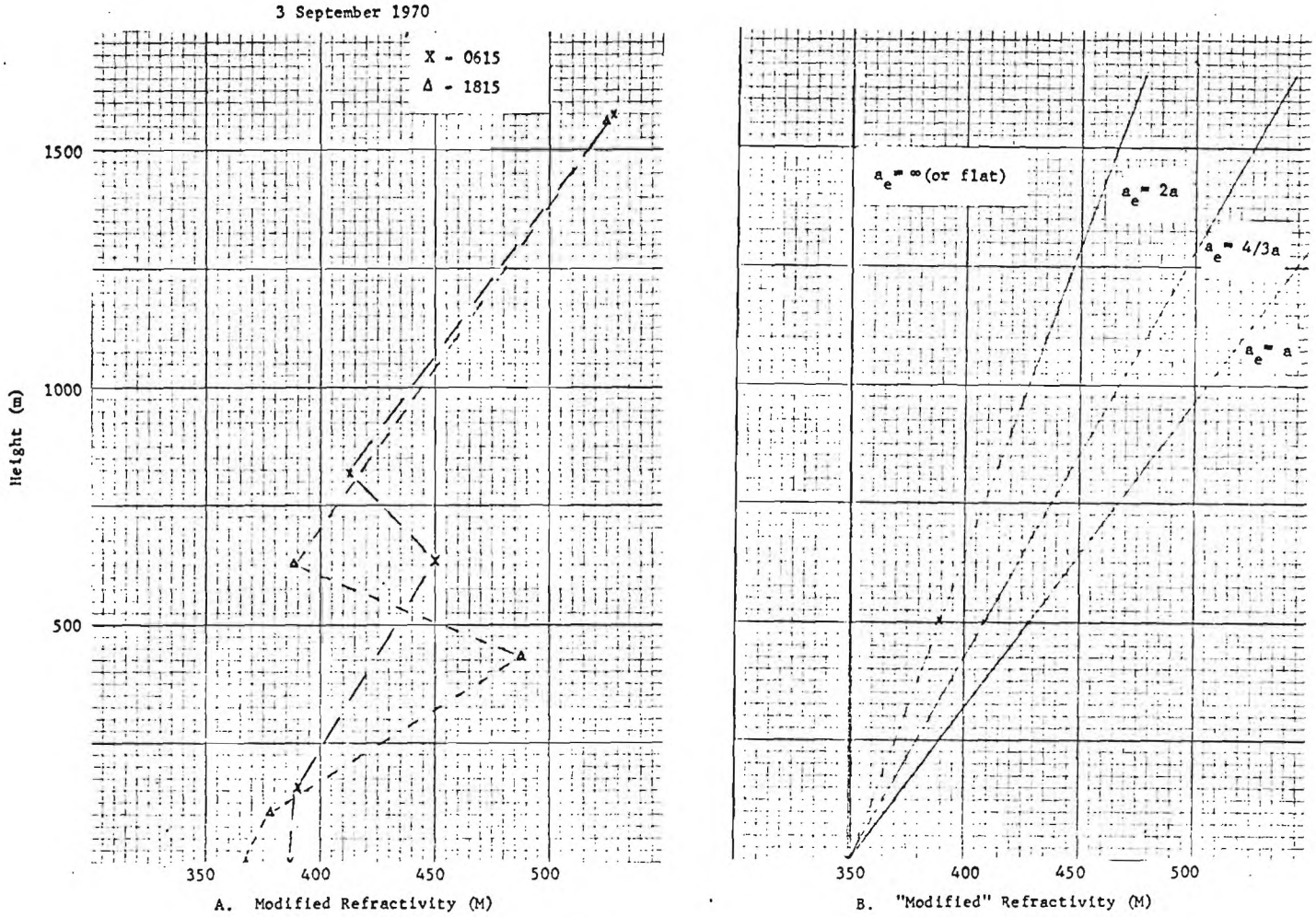


Figure II-1. Modified refractivity versus height for 3 September and for several assumed effective earth radii.

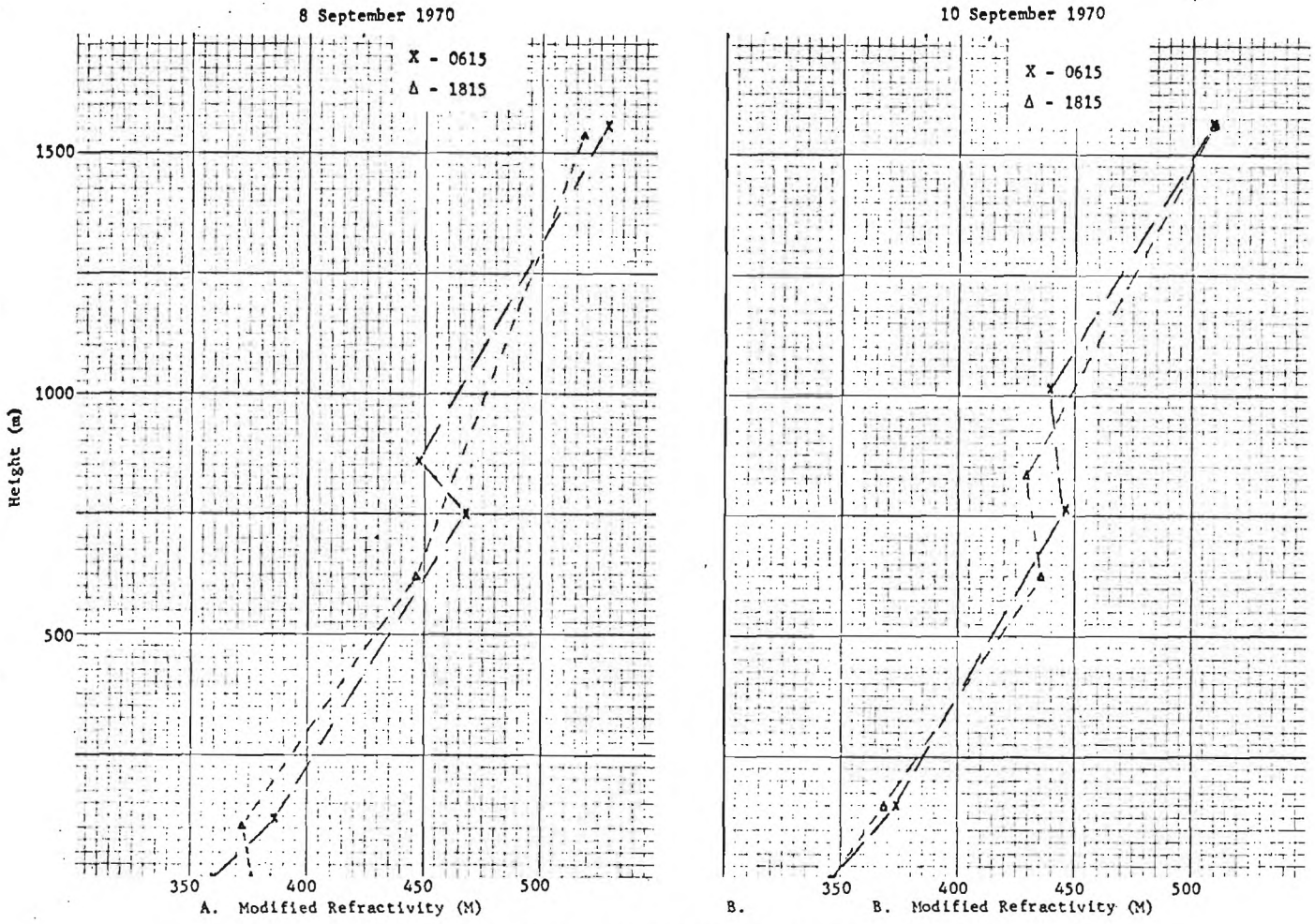


Figure II-2. Modified refractivity versus height for 8 and 10 September.

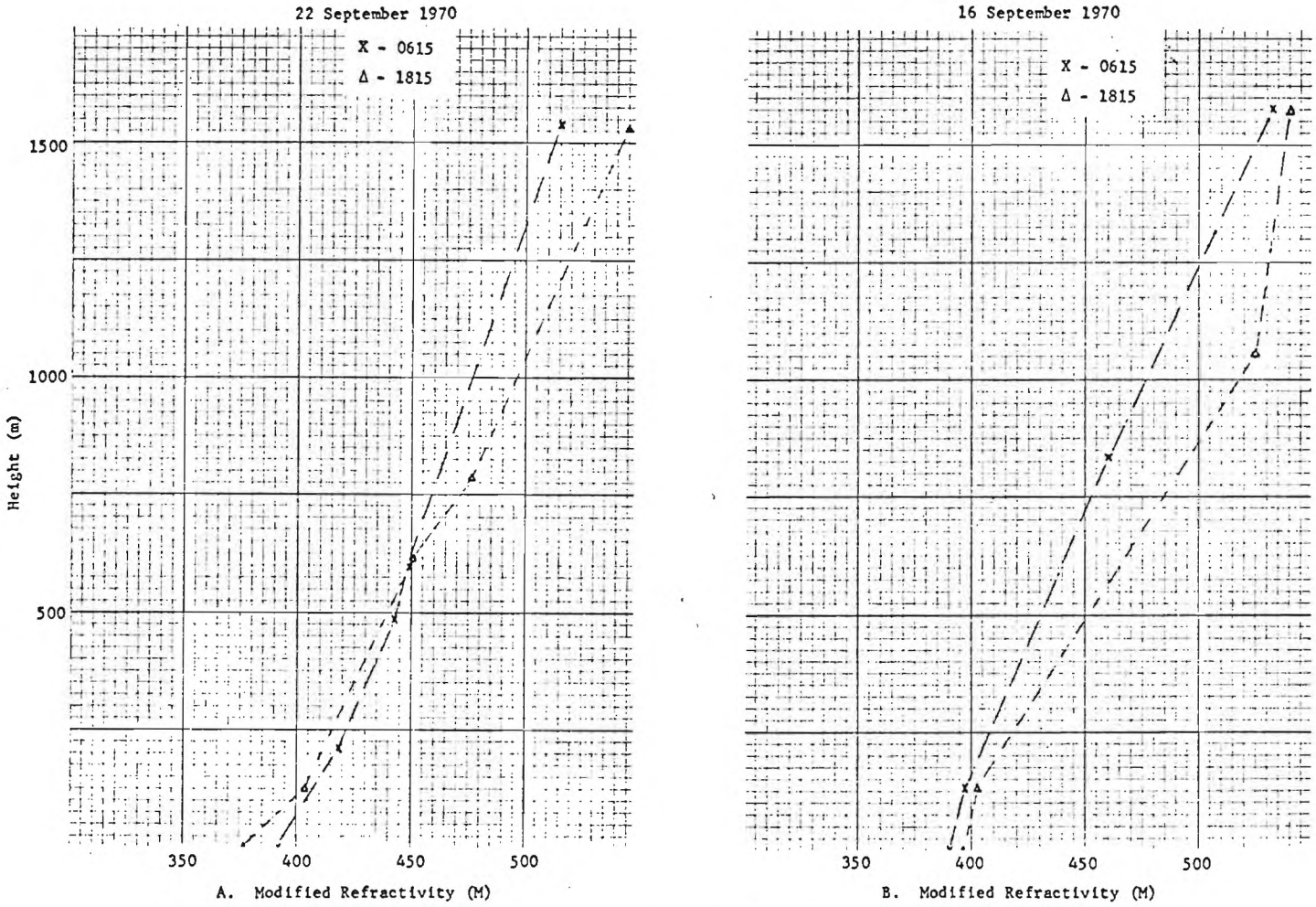


Figure II-3. Modified refractivity versus height for 16 and 22 September.

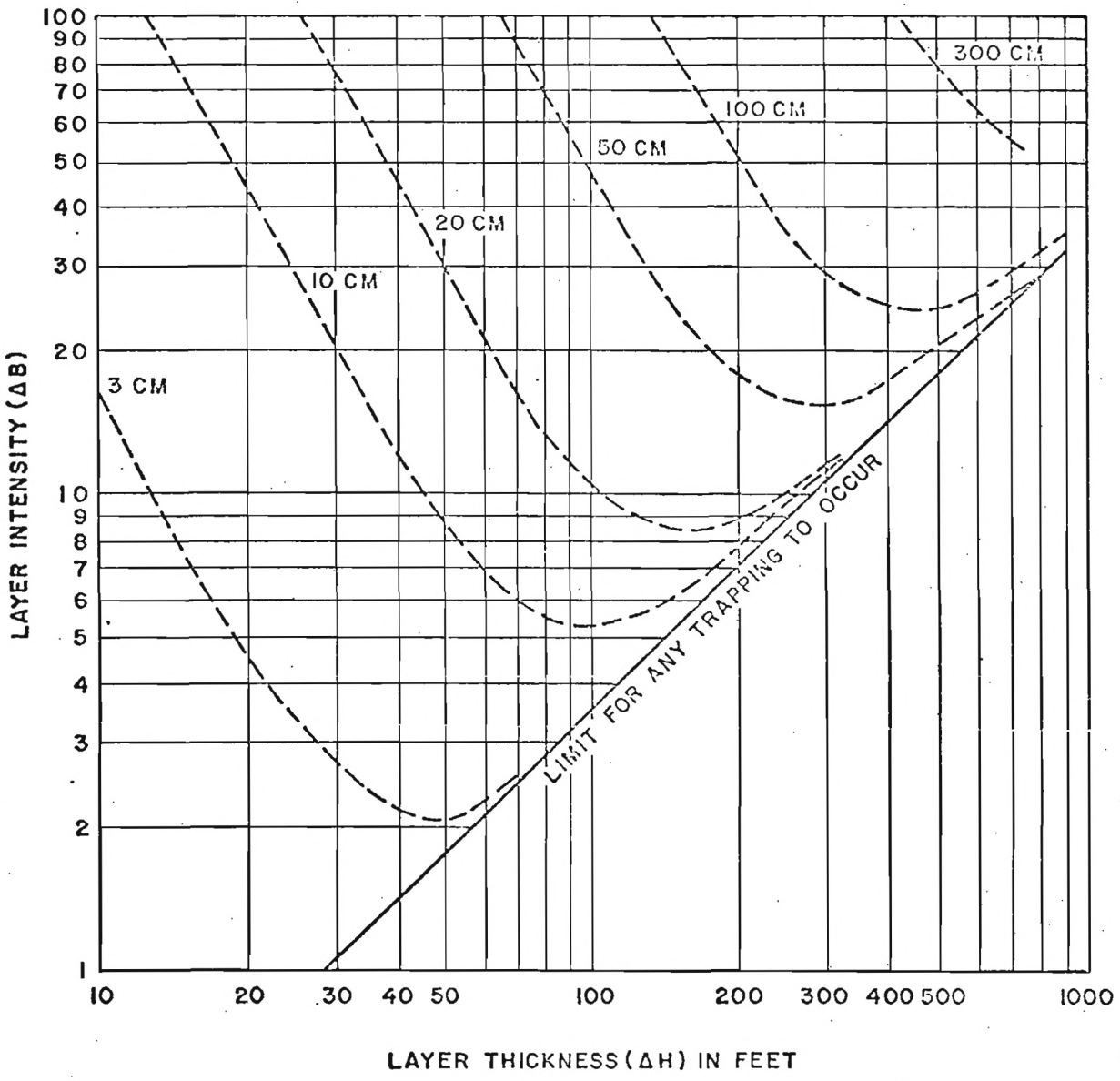


Figure II-4. Limits for trapping as a function of layer thickness and intensity. (from Reference 26, page 163)

WEATHER

DATA SUMMARIES

FOR SELECTED DAYS

IN SEPTEMBER 1970

TABLE II-1. RADIOSONDE DATA FOR SEPTEMBER 1970. (MIAMI, FLA.)

DATE/TIME	HEIGHT (Meters)	PRESSURE (mb)	DRY BULB TEMP (°C)	DEW POINT (°C)	DEPRESSION (°C)	REFRACTIVITY (N Units)
3 Sept. 70, 0615 EST	0	1017	27.2	---	2.2	386.7
	155	1000	27.2	---	4.0	365.8
	---	947	22.4	---	1.5	351.1
	---	931	22.4	---	9.0	285.4
	1571	850	17.4	---	5.0	275.6
3 Sept. 70, 1815 EST	0	1017	28.8	---	4.9	367.7
	150	1000	26.2	---	4.4	354.9
	---	968	23.8	---	2.2	417.8
	---	948	23.8	---	9.0	291.2
	1563	850	17.6	---	5.6	272.3
8 Sept. 70, 0615 EST	0	1013	25.0	---	3.6	360.1
	121	1000	26.0	---	3.0	367.7
	---	937	21.6	---	0.9	349.7
	---	925	21.6	---	4.9	312.2
	1555	850	16.8	---	3.3	285.1
8 Sept. 70, 1815 EST	0	1013	29.4	---	4.4	375.9
	119	1000	27.0	---	5.0	353.7
	---	949	23.0	---	1.9	349.0
	1535	850	16.8	---	4.8	276.2
10 Sept. 70, 0615 EST	0	1017	27.8	---	5.0	347.8
	150	1000	26.6	---	3.2	351.0
	---	934	21.2	---	1.9	326.2
	---	909	21.2	---	7.0	280.5
	1567	850	17.0	---	5.0	262.3

TABLE II-1. RADIOSONDE DATA FOR SEPTEMBER 1970. (MIAMI, FLA.) (Continued)

DATE/TIME	HEIGHT (Meters)	PRESSURE (mb)	DRY BULB TEMP (°C)	DEW POINT (°C)	DEPRESSION (°C)	REFRACTIVITY (N Units)
10 Sept. 70, 1815 EST	0	1017	29.4	---	6.0	347.6
	150	1000	27.4	---	4.9	343.6
	---	949	23.0	---	1.5	337.1
	---	927	21.4	---	5.6	299.2
	1567	850	18.2	---	5.7	262.8
15 Sept. 70, 0615 EST	0	1015	26.1	23.6	---	298.5
	136	1000	26.1	24.4	---	386.3
	1551	850	17.2	14.6	---	300.6
15 Sept. 70, 1815 EST	0	1015	25.6	24.0	---	388.0
	133	1000	24.7	23.0	---	378.2
	430	967	24.5	21.9	---	361.5
	1548	850	16.5	14.5	---	301.0
16 Sept. 70, 0615 EST	0	1018	26.7	24.5	---	390.2
	159	1000	26.5	22.5	---	371.0
	830	925	20.5	17.3	---	328.7
	1578	850	17.3	10.7	---	283.2
16 Sept. 70, 1815 EST	0	1017	27.8	25.6	---	396.1
	157	1000	26.9	23.5	---	378.7
	1060	902	20.3	15.7	---	358.9
	1576	850	17.7	12.8	---	292.0
17 Sept. 70, 0615 EST	0	1017	26.1	25.1	---	395.0
	157	1000	26.6	25.4	---	391.6
	1090	899	19.0	18.5	---	330.5
	1340	873	17.9	12.5	---	295.2
	1569	850	16.5	13.2	---	294.8

TABLE II-1. RADIOSONDE DATA FOR SEPTEMBER 1970. (MIAMI, FLA.) (Continued)

DATE/TIME	HEIGHT (Meters)	PRESSURE (mb)	DRY BULB TEMP (°C)	DEW POINT (°C)	DEPRESSION (°C)	REFRACTIVITY (N Units)
10 Sept. 70, 1815 EST	0	1017	29.4	---	6.0	347.6
	150	1000	27.4	---	4.9	343.6
	---	949	23.0	---	1.5	337.1
	---	927	21.4	---	5.6	299.2
	1567	850	18.2	---	5.7	262.8
15 Sept. 70, 0615 EST	0	1015	26.1	23.6	---	298.5
	136	1000	26.1	24.4	---	386.3
	1551	850	17.2	14.6	---	300.6
15 Sept. 70, 1815 EST	0	1015	25.6	24.0	---	388.0
	133	1000	24.7	23.0	---	378.2
	430	967	24.5	21.9	---	361.5
	1548	850	16.5	14.5	---	301.0
16 Sept. 70, 0615 EST	0	1018	26.7	24.5	---	390.2
	159	1000	26.5	22.5	---	371.0
	830	925	20.5	17.3	---	328.7
	1578	850	17.3	10.7	---	283.2
16 Sept. 70, 1815 EST	0	1017	27.8	25.6	---	396.1
	157	1000	26.9	23.5	---	378.7
	1060	902	20.3	15.7	---	358.9
	1576	850	17.7	12.8	---	292.0
17 Sept. 70, 0615 EST	0	1017	26.1	25.1	---	395.0
	157	1000	26.6	25.4	---	391.6
	1090	899	19.0	18.5	---	330.5
	1340	873	17.9	12.5	---	295.2
	1569	850	16.5	13.2	---	294.8

TABLE II-1. RADIOSONDE DATA FOR SEPTEMBER 1970. (MIAMI, FLA.) (Continued)

DATE/TIME	HEIGHT (Meters)	PRESSURE (mb)	DRY BULB TEMP (°C)	DEW POINT (°C)	DEPRESSION (°C)	REFRACTIVITY (N Units)
22 Sept. 70, 1815 EST	0	1014	28.9	23.3	---	376.5
	123	1000	26.8	24.5	---	385.5
	790	927	21.5	21.3	---	351.5
	1538	850	17.5	15.4	---	303.3
23 Sept. 70, 0615 EST	0	1014	25.0	24.5	---	392.2
	129	1000	26.6	23.6	---	379.2
	700	938	20.5	19.5	---	345.1
	1080	898	20.0	12.2	---	341.8
	1545	850	17.7	6.0	---	266.4

TABLE II-2. AIR-WATER TEMPERATURES FOR SELECTED DAYS IN SEPTEMBER 1970

DATE	AIR TEMPERATURE (°F) Min.	Max.	Avg.	SURF* TEMPERATURE (°F)
2 Sept.	81	86	84	88
3 Sept.	82	87	85	88
4 Sept.	80	88	84	88
7 Sept.	81	87	84	87
8 Sept.	79	88	84	89
9 Sept.	79	86	83	88
10 Sept.	81	87	84	88
11 Sept.	80	86	83	90
15 Sept.	73	83	78	85
16 Sept.	80	85	83	85
17 Sept.	73	85	79	85
21 Sept.	73	84	79	85
22 Sept.	74	85	80	85
23 Sept.	79	85	82	85

*Measured at 3 P.M. EST.

WEATHER LOG FOR WEEK OF August 30, 1970

	DAY	30 SUN	MON	TUES	WED	THURS	FRI	SAT
8:00 AM	Wind Speed and Dir.	22 ENE	15 ENE	5 ENE	8 NE	9 ENE	3 WNW	2 NW
	Sky		CLR	P.C.	P.C.	P.C.	P.C.	
	Precip.		NONE	NONE	NONE	NONE	NONE	
12:00 NOON	Wind Speed and Dir.	22 E	16 NE	10 NE	9 ENE	8 ENE	6 E	6 NW
	Sky		P.C.	P.C.	CLR	P.C.	P.C.	
	Precip.		NONE	NONE	NONE	NONE	NONE	
5:00 PM	Wind Speed and Dir.	21 ENE	10 NE	—	11 ENE	12 E	14 E	11 SE
	Sky		P.C.	CLR	P.C.	P.C.	CLDY	
	Precip.		NONE	NONE	NONE	NONE	NONE	
	Wind Speed and Dir.							
	Sky							
	Precip.							
Past 24 hour Rainfall			.00	.00	.00	.00	.00	

WEATHER LOG FOR WEEK OF SEPT. 6, 1970

	DAY	SUN	MON	TUES	WED	THURS	FRI	SAT
8:00 AM	Wind Speed and Dir.	6 CALM	2 CALM	6 CALM	5 N	2 W	4 NW	
	Sky			P.C.	P.C.	P.C.	P.C.	
	Precip.			NONE	NONE	NONE	NONE	
12:00 NOON	Wind Speed and Dir.	8 E	8 NE	14 NE	13 ENE	8 ENE	10 NNE	
	Sky			CLDY	P.C.	CLR	CLDY	
	Precip.			NONE	NONE	NONE	NONE	
5:00 PM	Wind Speed and Dir.	16 E	24 E	12 ENE	15 SSE	25 ENE	14 NNE	
	Sky			P.C.	CLDY	P.C.	P.C.	
	Precip.			NONE	NONE	NONE	NONE	
	Wind Speed and Dir.							
	Sky							
	Precip.							
Past 24 hour Rainfall				.00	.00	.03	.00	

WEATHER LOG FOR WEEK OF SEPT. 13, 1970

	DAY	SUN	MON	TUES	WED	THURS	FRI	SAT
8:00 AM	Wind Speed and Dir.		20 ENE	18 NE	35 ESE	11 ENE	29 ENE	
	Sky		CLDY	CLDY	CLDY	P.C.	CLDY	
	Precip.		LIGHT	NONE	NONE	NONE	NONE	
12:00 NOON	Wind Speed and Dir.		14 E	10 NE	26 E	20 ENE	16 ENE	
	Sky		CLDY	CLDY	P.C.	P.C.	CLDY	
	Precip.		NONE	NONE	NONE	NONE	HEAVY	
5:00 PM	Wind Speed and Dir.		3 NNE	8 E	14 ENE	30 ENE	11 SE	
	Sky		OVRCAST	CLDY	P.C.	P.C.	CLDY	
	Precip.		LIGHT	NONE	NONE	NONE	LIGHT	
	Wind Speed and Dir.							
	Sky							
	Precip.							
Past 24 hour Rainfall			.72	.24	.05		.16	

WEATHER LOG FOR WEEK OF SEPT. 20, 1970

	DAY	13 SUN	MON	TUES	WED	THURS	FRI	SAT
8:00 AM	Wind Speed and Dir.		8 ENE	13 NE	8 SE			
	Sky		CLDY	P.C.	P.C.			
	Precip.		NONE	NONE	MOD			
12:00 NOON	Wind Speed and Dir.		9 E	13 E	12 ENE			
	Sky		CLDY	P.C.	P.C.			
	Precip.		NONE	NONE	NONE			
5:00 PM	Wind Speed and Dir.		11 E	13 E				
	Sky		CLDY	P.C.				
	Precip.		NONE	NONE				
	Wind Speed and Dir.							
	Sky							
	Precip.							
Past 24 hour Rainfall				.00				

Rains Bring Flash Flood Threat to Mid-South

Heavy rains and high winds accompanied a few thunderstorms across the nation. Much of the heaviest rains were concentrated in the middle Mississippi Valley and along the Ohio River. In portions of Missouri and Kentucky flash flooding was predicted because of the rain. The southern Plains also were hit with heavy thunderstorms Fort Worth, Tex., was swamped with more than two inches of rain in one hour. A funnel cloud was observed northeast of Beaumont, Tex. But the windiest conditions during thunderstorms were recorded at scattered cities in the mountains of the West. Winds of 52 miles an hour ripped through Prescott, Ariz., and a 40-mile-an-hour wind was recorded in Livingston, Mont.

Weather Outlook

SMALL BOAT: Atlantic coastal waters — easterly winds 15 knots with seas 4 to 5 feet, both decreasing. Inland waters choppy but decreasing. Keys southward through Florida Straits — easterly winds 15 knots with seas 4 to 5 feet, briefly higher near showers. Gulf coast — east winds 10 to 15 knots and seas 2 to 3 feet north; easterly winds 15 knots and seas 3 to 4 feet south portion.

MIDDLE WEST COAST AND NAPLES AREAS: Fair through tomorrow with a slight chance of afternoon showers. Afternoon highs in the mid 90s. Lows in the 70s. Easterly winds 10 m.p.h. becoming variable tomorrow. Rain probability 20 per cent.

LAKE OKEECHOBEE AND INDIAN RIVER — BREVARD AREAS: Fair through tomorrow with a slight chance of afternoon showers. Highs in the 90s. Lows in the 70s. Mostly easterly winds 10 m.p.h. Rain probability 20 per cent.

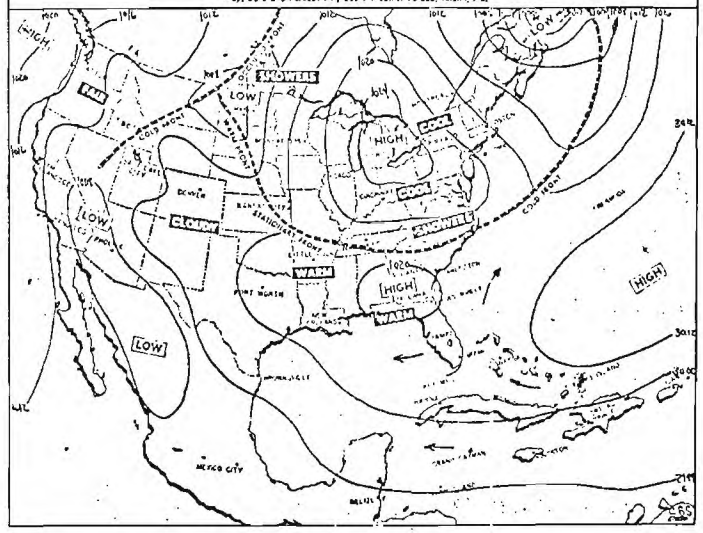
BROWARD — PALM BEACH AND KEYS AREAS: Fair to partly cloudy through tomorrow with a slight chance of afternoon showers. Highs near 90. Lows in the high 70s. Easterly winds 10 to 20 m.p.h. Rain probability 20 per cent, 30 per cent in the Keys.

FLORIDA: Mostly fair except local showers extreme south portion and Keys. Highs 83 to 93; lows near 80 south, 70s elsewhere. Extended outlook through Friday: partly cloudy with a few showers over interior of south and little temperature change.

FLORIDA EXTENDED OUTLOOK: Thursday through Saturday: Partly cloudy with a few showers interior sections Thursday and over extreme south portions Friday and Saturday. No important temperature changes. Afternoon highs 88 to 95. Lows mainly in the 70s.

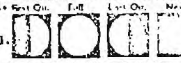
FORECAST WEATHER MAP FOR TUES. A.M. SEPT. 1, 1970

Map, Data and Forecasts By ESSA Weather Bureau, Miami, Fla.



Sunrise Today 7:01 a.m. **Sunset Today** 7:40 p.m.

Phases of the Moon



Sept. 8 Sept. 15 Sept. 22 Aug. 31

Moonrise Today 7:33 a.m. **Moonset Today** 8:06 p.m.

Local, National, World Temperatures

GREATER MIAMI

	H	L	Precip
Miami Airport	88	81	.04
Miami Beach	86	82	...

FLORIDA

	H	L	Precip
Apalachicola	91	77	...
Clewiston	90	74	...
Daytona Bch.	90	71	...
Ft. Laud.	89	76	...
Ft. Meyers	90	75	...
Gainesville	95	70	...
Homestead	89	74	.07
Islamorada	91	78	...
Jacksonville	90	73	...
Key West	86	76	.31
Lakeland	93	75	...
Naples	94	74	...
Ocala	95	73	...
Pensacola	89	74	...
Tallahassee	94	68	...
Vero Beach	90	78	...
W. P. Bch.	88	81	.12

SOUTH

	H	L	Precip
Asheville	90	60	...
Atlanta	95	71	...
Birmingham	92	68	...
Charleston	96	78	...
Charlotte	95	72	...
Jksn, Miss.	92	68	...
Little Rock	92	74	...
Louisville	86	77	...
Memphis	92	72	...
New Orleans	89	74	...
Raleigh	92	71	...
Richmond	95	76	.07

EAST

	H	L	Precip
Albany, N.Y.	73	62	.44
Boston	80	68	.04
Buffalo	68	57	...
New York	79	73	.07
Philadelphia	81	70	.09
Pittsburgh	77	63	.16
Washington	88	76	.02

MIDWEST

	H	L	Precip
Chicago	66	64	...
Cincinnati	85	75	...
Cleveland	69	62	...
Columbus	76	67	.12
Des Moines	82	60	...
Detroit	76	51	...
Duluth	74	53	...
Indianapolis	83	72	...
Kansas City	92	71	...
Milwaukee	68	56	...
Mpls.-St. P.	73	50	...
Omaha	84	57	...
St. Louis	88	72	...

WEST

	H	L	Precip
Albuquerque	87	67	...
Bismarck	86	44	...
Brownsville	95	80	...
Denver	88	53	...
Ft. Worth	92	73	2.35
Houston	88	75	...
Las Vegas	104	75	...
Los Angeles	84	64	..
Okla. City	93	69	...
Phoenix	109	82	...
Salt L. City	92	69	...
San Antonio	95	76	...
San Diego	76	64	...
S. Francisco	60	51	...
Seattle	66	60	...

FOREIGN

City	High
Aberdeen	66
Amsterdam	72
Athens	79
Birmingham	64
Cairo	88
Casablanca	77
Copenhagen	72
Dublin	63
Geneva	73
Hong Kong	81
Lisbon	82
Madrid	82
Malta	86
Manila	75
Moscow	72
New Delhi	86
Nice	77
Oslo	61
Paris	75
Reno	77
Saigon	82
Sofia	71
Stockholm	73
Sydney	55
Tel Aviv	86
Tokyo	79
Tunis	86
Vienna	71
Warsaw	73

PAN AMERICAN

Acapulco	89
Barbados	87
Bermuda	85
Bogota	68
Curacao	99
Havana	88
Hermosillo	106
Kingston	90
Los Mochis	102
Mazatlan	91
Mexico City	72
Monterrey	95
Nassau	84
San Juan P.R.	87
St. Kitts	87
Vera Cruz	81

Some Cooling Expected Over Much of Nation

Scattered thundershowers rumbled this afternoon in all but the Pacific Coast states and in the northeastern quarter of the nation and some of these storms were severe. Temperatures were high over much of the United States, particularly in the northern Plains region and the Southwest. Cooler temperatures prevailed in the Northeast. The national weather forecast: Cool weather will continue in the northeastern states and in the Pacific Northwest, and cooler air is likely from the northern Plains to the southern plateau region. Fair skies will be the rule, but some thundershowers will be scattered from the Appalachians to the Rockies.

SMALL BOATS: Inland waters along the southeast Florida coast including Biscayne and Florida bays — easterly winds 10-15 knots with a light to moderate chop on the waters. Over the Gulf coastal waters — easterly winds 10 knots, moving onshore during the afternoon. Seas 2-3 feet. Over the Atlantic coastal waters from Cape Kennedy to Jupiter Light — variable mostly east winds 10 knots with seas 2-3 feet.

MIDDLE WEST COAST AND BREVARD AREAS — Generally fair through Thursday with a chance of showers. Low 70 to 75. Afternoon highs 90 to 95. Variable winds 10 m.p.h.

NAPLES AND LAKE OKEECHOREE AREAS — Generally fair through Thursday with a slight chance of afternoon showers. Low in the mid 70s. Afternoon highs 92 to 95. Mostly east winds 10 m.p.h. Rain probability 20 per cent.

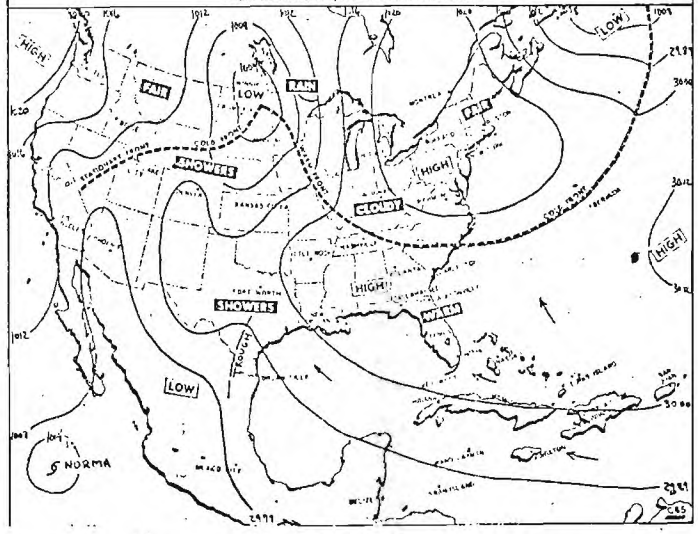
BROWARD, PALM BEACH AND KEYS AREAS — Partly cloudy through Thursday with a chance of showers. Low 75 to 80. Afternoon highs 85 to 90. Easterly winds 10 to 15 m.p.h. Rain probability 30 per cent.

FLORIDA — Generally fair, with a few showers in the extreme southern portion and afternoon showers in the extreme northern portion. Highs in the 90s in the north and 89-95 in the south. Night lows 68-75 north and near 80 along the southeast coast and Keys.

FLORIDA: EXTENDED OUTLOOK — Friday through Sunday: Partly cloudy with widely scattered mainly afternoon and evening thundershowers. Afternoon highs 88 to 95. Overnight lows mainly in the 70s.

FORECAST WEATHER MAP FOR WED. A.M. SEPT. 2, 1970

Map, Data and Forecasts By USA Weather Bureau, Miami, Fla.



Sunset Today 7:39 p.m. Moonrise Today 8:23 a.m.

Sunset Today 7:10 p.m. Moonset Today 8:33 p.m.

Phases of the Moon

Sept. 8 Sept. 15 Sept. 22 Aug. 31

Local, National, World Temperatures

GREATER MIAMI

	H	L	Precip
Coral Gables	87	77	19
Miami Airport	87	80	27
Miami Beach	86	77	11
North Miami Beach	93	79	...
South Miami	90	76	.13

FLORIDA

	H	L	Precip
Apalachicola	90	73	...
Clewilston	90	74	...
Clewiston	90	74	...
Daytona Bch	94	70	...
Ft. Laud.	90	76	...
Ft. Myers	91	74	...
Gainesville	95	70	...
Homestead	90	73	.04
Islamorad	91	78	...
Jacksonville	95	75	.19
Key West	87	77	...
Lakeland	91	72	...
Naples	95	74	...
Ocala	97	70	...
Orlando	95	70	...
Pensacola	91	75	...
Sarasota	94	71	...
St. Pete.	93	78	...
Tallahassee	95	63	...
Tampa	94	69	...
Vero Beach	91	72	...
W.P. Bch	88	81	.04

SOUTH

	H	L	Precip
Asheville	87	66	...
Atlanta	93	73	...
Birmingham	91	70	...
Charleston	93	78	...
Charlotte	90	75	...
Little Rock	97	71	...
New Orleans	87	72	.18
Raleigh	84	67	...
Richmond	84	63	...

EAST

	H	L	Precip
Albany, N.Y.	70	50	...
Boston	72	55	...
Buffalo	70	51	...
New York	75	57	...
Philadelphia	74	59	...
Pittsburgh	72	47	...
Washington	79	64	...

MIDWEST

	H	L	Precip
Chicago	70	63	...
Cincinnati	83	65	...
Cleveland	70	42	...
Columbus	74	53	...
Des Moines	89	67	...
Detroit	76	43	...
Duluth	75	44	.03
Indianapolis	92	69	...
Kansas City	95	75	...
Milwaukee	71	46	...
Mpls.-St. P.	78	56	...
Omaha	94	66	...
St. Louis	82	69	...

WEST

	H	L	Precip
Bismarck	94	55	...
Brownsville	93	72	...
Denver	90	54	.04
Ft. Worth	82	72	1.58
Houston	76	72	2.02
Las Vegas	101	76	...
Los Angeles	84	64	...
Okla. City	87	72	...
Phoenix	109	81	...
Salt L. City	89	63	...
San Antonio	86	75	...
San Diego	75	65	...
S. Francisco	61	52	...
Seattle	67	58	...

FOREIGN

City	High
Aberdeen	61
Auckland	57
Berlin	71
Birmingham	61
Casablanca	79
Copenhagen	68
Dublin	61
Geneva	73
Hong Kong	84
Lisbon	81
London	61
Madrid	84
Manila	73
Moscow	66
New Delhi	91
Nice	77
Oslo	63
Paris	64
Rome	79
Saigon	82
Sofia	61
Stockholm	73
Tel Aviv	86
Tokyo	82
Warsaw	73

PAN AMERICAN

Acapulco	87
Havana	88
Hermosillo	85
Kingston	90
Los Mochis	85
Mazatlan	91
Mexico City	72
Monterrey	84
Nassau	8
St Kitts	86
Vera Cruz	89

Rains Causing Flooding in Texas, Oklahoma

Locally heavy rain in eastern Texas and southeastern Oklahoma caused many rivers and streams to overflow. Three to seven inches of rain fell in the last 24-36 hours in many parts of the region. Scattered showers and locally heavy thundershowers also occurred from Minnesota and eastern South Dakota to Louisiana, and in the northern Great Lakes and the Southeast. The weather remained sunny, warm and dry from the high Plains to the interior sections of the Pacific states. A large cool air system also brought and pleasant conditions to the Northeast. The national forecast: Sunny weather is in store for much of the nation. Scattered mainly afternoon thundershowers are expected from the Gulf to Michigan.

Weather Outlook

SMALL BOATS: Over the Atlantic coastal waters from Jupiter Light to Key Largo and eastward thru the western Bahamas — easterly winds 10 to occasionally 15 knots with seas 2-3 feet. Inland waters along the southeastern Florida coast including Biscayne and Florida bays — easterly winds 10 to occasionally 15 knots during the afternoon. Waters will have only a light chop. Over the gulf coastal waters north of Florida Bay to Cedar Key — variable winds 10 knots becoming onshore during the afternoon. Seas 2 feet.

MIDDLE WEST COAST AND NAPLES AREAS: Generally fair through tomorrow but with chance of an afternoon thundershower. Low tonight in the 70s. Afternoon highs 90 to 96. Variable winds 10 m.p.h. gusty near thundershowers. Rain probability 30 per cent.

LAKE OKEECHOBEE AND INDIAN RIVER BREVARD AREAS: Generally fair through tomorrow with only a slight chance of showers. Low tonight 72 to 76. Afternoon highs in the low 90s. Variable winds 10 m.p.h. becoming easterly in the afternoon. Rain probability 20 per cent.

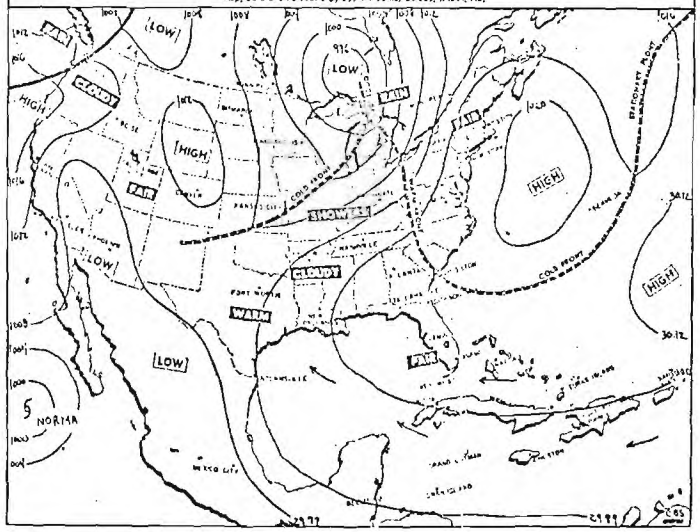
BROWARD PALM BEACH AND KEYS AREAS: Partly cloudy through tomorrow with only a chance of a shower. Low tonight 75 to 80. Afternoon highs near 90. Easterly winds 10 to occasionally 15 m.p.h. Rain probability 30 per cent.

FLORIDA: Generally fair, with a chance of afternoon thundershowers. Highs 90-96. Lows at night mainly in the 70s, near 60 in the southern part of the state.

FLORIDA EXTENDED OUTLOOK: Saturday through Monday: Partly cloudy with widely scattered mainly afternoon and evening thundershowers. Afternoon highs 83 to 95. Overnight lows mainly in the 90s.

FORECAST WEATHER MAP FOR THURS. A.M. SEPT. 3, 1970

Map, Data and Forecasts By ESSA Weather Bureau, Miami, Fla.



Sunrise Today 7:02 a.m.
Sunset Today 7:38 p.m.

Phases of the Moon

Sept. 8 Sept. 15 Sept. 22 Sept. 30

Moonrise Today 9:15 a.m.
Moonset Today 9:03 p.m.

Local, National, World Temperatures

GREATER MIAMI

	H	L	Precip
Coral Gables	87	77	19
Miami Airport	87	80	27
Miami Beach	86	77	.11
North Miami Beach	93	79	...
South Miami	90	74	.13

FLORIDA

	H	L	Precip
Apalachicola	90	73	...
Clewiston	96	74	...
Clewiston	98	74	...
Daytona Bch	94	70	...
Ft. Laud.	90	76	...
Ft. Myers	91	74	...
Gainesville	95	70	...
Homestead	90	73	.04
Islamorad	91	78	...
Jacksonville	95	75	.19
Key West	87	77	...
Lakeland	91	72	...
Naples	95	74	...
Ocala	97	70	...
Orlando	95	70	...
Pensacola	91	75	...
Sarasota	94	71	...
St. Pete.	93	78	...
Tallahassee	95	63	...
Tampa	94	69	...
Vero Beach	91	72	...
W.P. Bch	88	81	04

SOUTH

	H	L	Precip
Asheville	87	66	...
Atlanta	93	73	...
Birmingham	91	70	...
Charleston	93	78	...
Charlotte	90	73	...
Little Rock	97	71	...
New Orleans	87	72	.10
Raleigh	84	67	...
Richmond	84	63	...

EAST

	H	L	Precip
Albany, N.Y.	70	50	...
Boston	72	55	...
Buffalo	70	51	...
New York	75	57	...
Philadelphia	74	59	...
Pittsburgh	72	47	...
Washington	79	64	...

MIDWEST

	H	L	Precip
Chicago	70	63	...
Cincinnati	83	65	...
Cleveland	70	47	...
Columbus	74	53	...
Des Moines	89	67	...
Detroit	76	63	...
Duluth	75	44	.03
Indianapolis	92	69	...
Kansas City	95	75	...
Milwaukee	71	46	...
Mpls.-St. P.	78	56	...
Omaha	94	66	...
St. Louis	86	69	...

WEST

	H	L	Precip
Albuquerque	87	60	...
Anchorage	63	49	...
Bismarck	86	55	...
Brownsville	95	77	...
Denver	88	54	...
Ft. Worth	92	72	3.74
Houston	88	76	15
Las Vegas	104	79	...
Los Angeles	84	64	...
Okla. City	93	72	...
Phoenix	109	85	...
Salt L. City	92	64	.11
San Antonio	95	75	...
San Diego	76	68	...
S. Francisco	61	53	...
Seattle	66	58	...

FOREIGN

City	High
Aberdeen	61
Auckland	57
Berlin	71
Birmingham	63
Casablanca	79
Copenhagen	68
Dublin	61
Geneva	73
Hong Kong	84
Lisbon	81
London	61
Madrid	86
Manila	73
Moscow	66
New Delhi	91
Nice	77
Oslo	63
Paris	64
Rome	79
Saigon	92
Sofia	61
Stockholm	71
Tel Aviv	86
Tokyo	82
Warsaw	73

PAN AMERICAN

City	High
Acapulco	92
Havana	93
Hermosillo	85
Kingston	90
Los Mochis	85
Mazatlan	91
Mexico City	72
Monterrey	84
Nassau	8
St Kitts	86
Vera Cruz	89

A Fine Labor Day Weekend Awaits Mid-America

Weather Outlook

SMALL BOATS: Over the Atlantic coastal waters from Jupiter Light to Key Largo and eastward through the western Bahamas — east and southeast winds 10 to occasionally 15 knots with seas 2 to 3 feet. Over inland waters along the southeast Florida coast including Biscayne and Florida bays — east and southeast winds 10 to occasionally 15 knots with a light to moderate chop on the waters. Over the Atlantic coastal waters from Cape Kennedy to Jupiter Light — variable winds to 10 knots becoming east and southeast 10 to 15 knots during the afternoon, seas 2 to 3 feet.

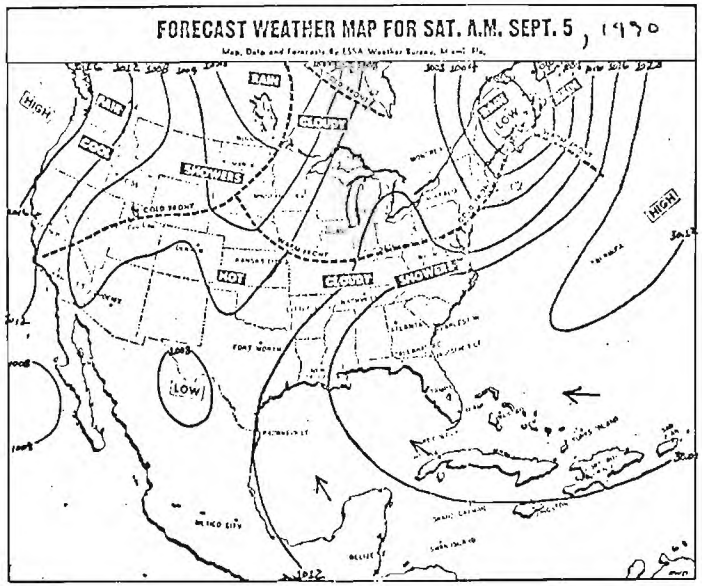
MIDDLE WEST COAST AREAS: Partly cloudy through Sunday with chance of afternoon thundershowers. Low tonight in 70s. Afternoon high in low to mid 90s. Variable winds 10 to occasionally 15 mph gusty near thundershowers. Rain probability 30 per cent.

NAPLES -- LAKE OKEECHOBEE AREAS: Partly cloudy through Sunday with chance of afternoon and evening thundershowers. Low tonight in 70s. Afternoon highs 90 to 95. Variable winds 10 to occasionally 15 mph becoming southwesterly in afternoons. Winds gusty near thundershowers. Rain probability 50 per cent.

INDIAN RIVER--BROWARD--KEYS AREAS: Partly cloudy through Sunday with chance of a few showers. Low tonight 75 to 80. Afternoon highs near 90. East and southeast winds 10 to 15 mph gusty near showers. Rain probability 30 per cent.

FLORIDA — EXTENDED OUTLOOK: Monday through Wednesday. Widely scattered mainly afternoon thundershowers. Partly cloudy weather. Daytime highs 88 to 96. Over-night lows mainly in 70s.

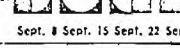
Mostly fair weather heralds the beginning of the Labor Day weekend over the nation's midsection and in the Southwest. Fine weather is typical from the eastern slopes of the Rockies to the upper and lower Mississippi Valley and in the Middle Atlantic states. Showers are prevalent over the Southeast and in New England. The national weather forecast: A sunny and pleasant day is expected over much of the nation. However, it will turn cooler over the central Rockies and parts of the Great Basin. Widely scattered thundershowers will occur from the lower Mississippi Valley into the Carolinas and Florida.



Sunrise Today 7:02 a.m.

Sunset Today 7:36 p.m.

Phases of the Moon



Sept. 8 Sept. 15 Sept. 22 Sept. 30

Moonrise Today 11:04 a.m.

Moonset Today 10:07 p.m.

Local, National, World Temperatures

GREATER MIAMI

	H	L	Precip.
Coral Gables	90	80	...
Miami Airport	89	79	...
Miami Beach	88	82	...
North Miami Beach	94	77	...
South Miami	93	72	...

FLORIDA	H	L	Precip.
Apalachicola	90	70	...
Clewiston	91	71	...
Daytona Bch.	93	74	...
Ft. Laud.	91	84	...
Ft. Myers	91	75	...
Gainesville	93	74	.13
Islamorada	91	82	.62
Jacksonville	96	76	...
Key West	88	80	...
Lakeland	91	75	...
Naples	91	73	.31
Ocala	97	73	...
Orlando	96	76	.92
Pensacola	90	76	.92
St. Pete.	90	80	...
Tallahassee	94	67	.62
Tampa	91	77	.20
Vero Beach	92	73	...
W. P. Bch.	90	78	...

SOUTH	H	L	Precip.
Asheville	89	62	.09
Atlanta	88	72	...
Birmingham	89	75	.19
Charleston	91	80	.04
Charlotte	91	73	...
Jtson, Miss.	92	74	...
Little Rock	89	68	.48
Louisville	80	71	.03
Memphis	87	69	1.09
New Orleans	91	74	...
Raleigh	89	69	.23
Richmond	95	72	.14

EAST	H	L	Precip.
Albany, N.Y.	84	67	.04
Boston	84	65	...
Buffalo	75	70	.24
New York	90	73	.04
Philadelphia	91	76	...

	H	L	Precip.
Pittsburgh	85	69	.43
Washington	94	77	...

MIDWEST	H	L	Precip.
Chicago	80	69	...
Cincinnati	84	71	.03
Cleveland	85	67	.22
Columbus	84	69	.88
Des Moines	87	67	...
Detroit	86	68	.03
Duluth	85	55	...
Indianapolis	77	68	.01
Kansas City	87	68	1.84
Milwaukee	82	66	...
Mnls.-St. P.	87	57	...
Omaha	84	63	...
St. Louis	87	71	...

WEST	H	L	Precip.
Albuquerque	77	62	.01
Bismarck	95	61	...
Brownsville	96	80	...
Denver	86	53	...
Ft. Worth	95	77	...
Houston	93	79	...
Las Vegas	96	76	...
Los Angeles	77	58	...
Okla. City	101	79	...
Phoenix	84	74	.30
Salt L. City	86	63	...
San Antonio	99	79	...
San Diego	72	64	...
S. Francisco	64	54	...
Seattle	65	53	.16

FOREIGN	High
City	
Aberdeen	54
Amsterdam	63
Athens	87
Berlin	61
Birmingham	68
Brussels	63
Casablanca	79
Copenhagen	61
Dublin	61
Geneva	72
Hong Kong	81
Lisbon	84
London	66
Madrid	86
Malta	87
Manila	77
Moscow	64
New Delhi	79
Oslo	59
Paris	66
Rome	81
Saimon	82
Sofia	75
Stockholm	63
Sydney	61
Tel Aviv	84
Tokyo	73
Tunis	86
Vienna	61
Warsaw	57

PAN AMERICAN	
Acapulco	82
Barbados	88
Bermuda	81
Bonota	66
Culvecan	82
Havana	88
Kingston	88
Mexico City	77
San Juan P.R.	88
St. Kitts	87
Vera Cruz	82

Rains Dot West; East, South Continue Warm

The holiday weather was one of contrast across the nation. Travelers warnings remained in effect for the Colorado Rockies because of snow in the higher mountain elevations and passes. At the same time locally heavy rains spread across Arizona and New Mexico while warm weather continued in a broad sweep from the Gulf states northward to the Canadian border. Rain or shower activity was scattered from the Northwest to the Great Basin. Thundershowers occurred along the humid Gulf regions and in advance of a cold front headed toward the upper Mississippi Valley. The national forecast: occasional showers are expected from the Pacific Northwest to the north and central Rockies with snow in the mountains of the central Rockies.

Weather Outlook

MIDDLE WEST COAST AND NAPLES AREAS: Partly cloudy through tomorrow with a chance of afternoon thundershowers. Lows in the 70's. Highs 90 to 94. Variable winds 10 m.p.h. gusty near showers. Rain probability 40 per cent.

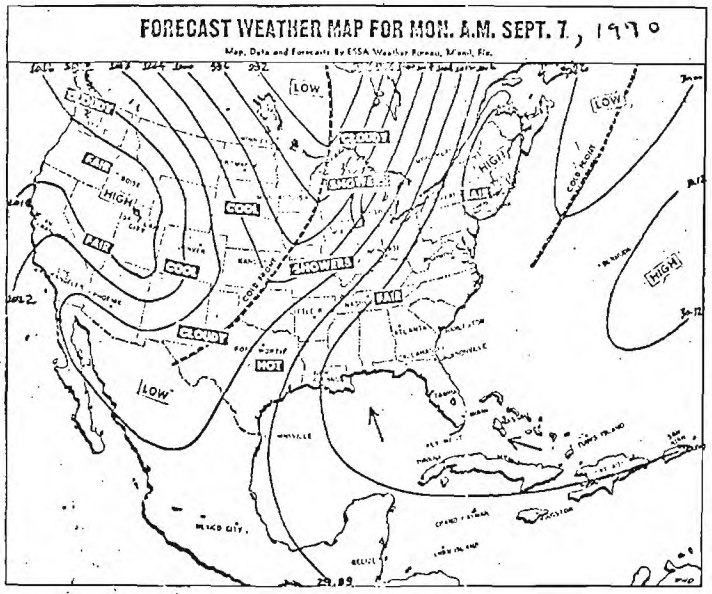
LAKE OKEECHOBEE AND INDIAN RIVER-BREVARD AREAS: Partly cloudy through tomorrow with a chance of afternoon thundershowers. Lows in the 70's. Highs 90 to 96. Variable winds 10 m.p.h. gusty near showers. Rain probability 30 per cent.

BROWARD-PALM BEACH AND KEYS AREAS: Partly cloudy through tomorrow with a chance of showers. Lows in the high 70's. Highs around 90. Mostly easterly winds 10 m.p.h. Rain probability 30 per cent.

FLORIDA: Partly cloudy with widely scattered mainly afternoon and evening thundershowers except a few night and morning showers Keys and southeastern beaches. Afternoon highs 88 to 96.

FLORIDA EXTENDED OUTLOOK: Wednesday through Friday: Warm with widely scattered afternoon thundershowers. Highs 88 to 96. Lows in 70's.

SMALL BOATS: Atlantic coastal waters — Variable winds 10 knots becoming easterly during the afternoons. Seas 2 feet or less. Inland waters will have a light chop except briefly choppy near a few thundershowers. Keys southward through the Florida straits — East and southeast winds 10 knots with seas around 2 feet. Winds and seas briefly higher near a few thundershowers. Gulf coastal waters — Variable winds 10 knots becoming onshore during the afternoons. Seas 2 feet or less. Winds and seas briefly higher near a few thundershowers.



Sunrise Today 7:03 a.m. **Sunset Today** 7:34 p.m.

Phases of the Moon

Sept. 8 Sept. 15 Sept. 22 Sept. 30

Moonrise Today 1:02 p.m. **Moonset Today** 11:34 p.m.

Local, National, World Temperatures

GREATER MIAMI

	H	L	Precip		H	L	Precip.
Coral Gables	89	75	...	North Miami Beach	95	75	...
Miami Airport	90	77	...	South Miami	93	72	...
Miami Beach	88	80	...				

FLORIDA				MIDWEST					
Apalachicola	94	79	..	Chicago	81	67	..	Cairo	63
Clewiston	91	71	..	Cincinnati	85	65	.15	Casablanca	89
Daytona Bch.	91	74	.16	Cleveland	76	62	.07	Copenhagen	61
Ft. Laud.	91	82	...	Columbus	83	60	..	Dublin	61
Ft. Myers		74	...	Des Moines	73	63	.27	Geneva	73
Gainesville	93	74	...	Detroit	83	58	..	Hong Kong	82
Islamorada	91	82	...	Duluth	72	59	..	Lisbon	91
Jacksonville	94	74	...	Indianapolis	85	57	.12	London	70
Key West	88	79	...	Kansas City	90	75	.05	Madrid	89
Lakeland	93	74	...	Milwaukee	78	60	..	Malta	84
Naples	91	72	...	Mpls-St. P.	88	65	..	Moscow	63
Orlando	94	76	.08	Omaha	81	67	.03	New Delhi	81
Pensacola	92	76	...	St. Louis	80	60	.03	Nice	77
St. Pete.	93	78	...					Oslo	63
Tallahassee	92	70	...	WEST				Paris	70
Tampa	90	74	.40	Albuquerque	86	60	...	Rome	81
Vero Beach	93	74	..	Bismarck	96	68	...	Saigon	82
W.P. Bch.	90	74	.01	Brownsville	96	79	...	Sofia	70
SOUTH				Denver	80	55	...	Stockholm	57
Asheville	86	66	..	Houston	91	78	..	Sydney	57
Atlanta	88	71	..	Las Vegas	80	68	...	Tel Aviv	84
Birmingham	87	73	.02	Los Angeles	78	63	..	Tokyo	79
Charleston	90	78	..	Okla. City	99	76	..	Tunis	84
Charlotte	92	71	..	Phoenix	83	72	1.46	Vienna	70
Jkson, Miss.	94	74	...	Salt L. City	55	47	1.61	Warsaw	57
Little Rock	92	75	...	San Antonio	98	77	...	PAN AMERICA	
Louisville	84	67	...	San Diego	69	64	..	Acapulco	88
Memphis	91	79	...	S. Francisco	72	58	..	Barbados	82
New Orleans	92	76	...	Seattle	59	53	..	Bermuda	80
Raleigh	85	67	...	FOREIGN				Culiacan	90
Richmond	93	70	...	City			High	Havana	91
EAST				Aberdeen			59	Hermosillo	84
Boston	84	66	...	Amsterdam			60	Kingston	90
Buffalo	69	64	...	Ankara			77	Los Mochis	91
New York	90	73	...	Athens			84	Mexico City	75
Philadelphia	87	73	..	Auckland			54	Monterrey	99
Pittsburgh	80	63	.51	Berlin			64	Nassau	81
Washington	91	73	...	Birmingham			63	San Juan PR	88
				Brussels			70	St Kitts	87
								Vera Cruz	90

East and West Get Their First Taste of Autumn

Autumn-like weather showed up on the weather scene in the Northwest and Northeast. High pressure dominated and cool air held sway in these areas as high temperatures reached only to the 60s. Meanwhile, fair and pleasant weather was the rule from the Southwest to the upper and middle Mississippi Valley. Scattered showers and thunderstorms occurred over the Gulf states and the lower Plains and lines of thunderstorms were active along a cold front from New York to eastern Kentucky. The national weather forecast for today: Sunny and pleasant weather is in store for most of the nation. Scattered showers and thunderstorms are on tap from the Gulf states to the Ohio Valley.

Weather Forecast

MIAMI AND VICINITY: Sunny today with high near 90. Low in the 70s. Mostly east winds 10 m.p.h. Shower probability 30 per cent.

SMALL BOATS: Inland waters along the southeast Florida coast, including Biscayne and Florida bays — Variable mostly east and southeast winds 10 knots with light chop on waters. Gusty winds and choppy waters near widely scattered thundershowers.

FLORIDA: Partly cloudy with widely scattered thundershowers mainly over the southern two thirds of the state in afternoons, evenings over adjacent waters at night. Highs 88 to 95. Lows in the 70s.

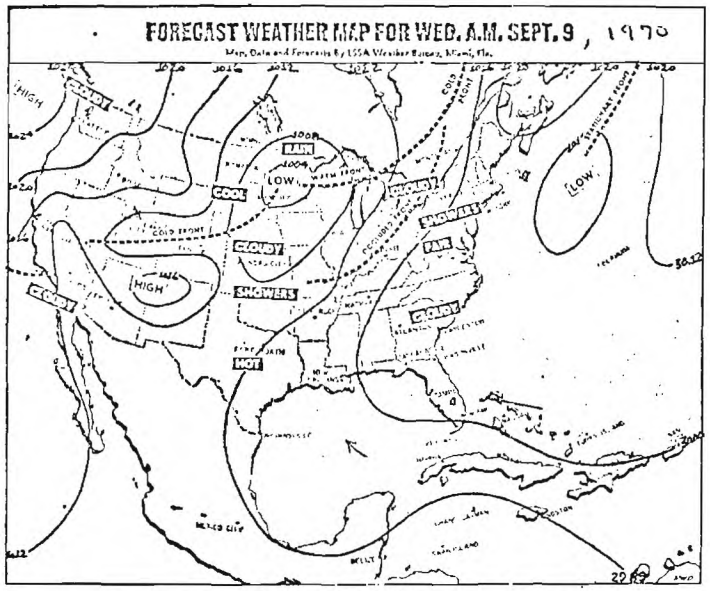
FLORIDA EXTENDED OUTLOOK: Thursday through Saturday. Warm throughout state with widely scattered afternoon thundershowers. Highs 88 to 94. Lows in the 70s.

KEYS AREAS: Partly cloudy through tomorrow with chance of showers. Lows upper 70s. Highs near 90. Variable mostly southeast winds 10 m.p.h. Rain probability 30 per cent.

MIDDLE WEST COAST, NAPLES AND LAKE OKEECHOBEE AREAS: Partly cloudy through tomorrow with chance of afternoon thundershowers. Lows 70 to 76. Highs 88 to 94. Variable winds 10 m.p.h. gusty near showers. Rain probability 40 per cent.

Statistics

September 8, 1970	7:00 A.M.	7:00 P.M.
Barometer (inches)	29.95	29.94
Relative humidity	91%	60%
Highest temperature (last 12 hours)		90
Lowest temperature (last 18 hours)		76
Mean temperature		83
Normal temperature		82
Accumulated excess since first of month		15
Accumulated excess in temperature since Jan. 1 (degrees)		177
Highest and lowest this date since 1939		93 and 71
Local rainfall for 24 hours ending 7 p.m.		0
Rainfall this month in inches		.27
Rainfall deficiency this month in inches		1.93
Rainfall since Jan. 1 in inches		32.83
Deficiency since Jan. 1 in inches		6.95



Sunrise Today 7:04 a.m. Sunset Today 7:32 p.m.

Phases of the Moon

Sept. 8 Sept. 15 Sept. 22 Sept. 30

Moonrise Today 3:04 p.m. Moonset Thurs. 1:28 a.m.

Local, National, World Temperatures

GREATER MIAMI

	H	L	Precip
Coral Gables	92	74	...
Miami Airport	90	76	...
Miami Beach	88	79	...
North Miami Beach	96	72	...
South Miami	96	69	...

FLORIDA	H	L	Precip
Apalachicola	91	73	...
Bradenton	90	72	.22
Clewiston	91	69	...
Daytona Bch.	91	73	...
Ft. Laud.	90	74	...
Ft. Myers	92	75	.10
Gainesville	91	71	...
Homestead	92	69	...
Islamorada	93	78	...
Jacksonville	91	72	...
Key West	88	78	...
Lakeland	91	69	1.30
Naples	91		...
Ocala	94	70	1.28
Orlando	95	74	...
Pensacola	90	74	1.61
Sarasota	90	72	.22
St. Pete.	95	78	...
Tallahassee	91	70	...
Tampa	93	72	...
Vero Beach	93	74	...
W.P. Bch.	92	76	...

SOUTH	H	L	Precip
Asheville	77	59	...
Atlanta	84	71	...
Birmingham	87	67	.15
Charleston	86	74	...
Charlotte	79	65	..
Jkson, Miss.	95	72	..
Little Rock	96	72	...
Louisville	85	71	...
Memphis	94	74	...
New Orleans	92	75	...
Raleigh	83	59	...
Richmond	87	57	...

EAST	H	L	Precip
Albany, N.Y.	73	57	...
Bermuda	82	73	.18
Boston	64	54	...
Buffalo	79	59	...
Montreal	68	41	...
New York	79	61	...
Philadelphia	83	63	...
Pittsburgh	81	59	...
Toronto	71	56	...
Washington	85	60	..

MIDWEST	H	L	Precip
Chicago	89	67	.04
Cincinnati	86	72	.10
Cleveland	84	65	...
Columbus	86	65	...
Des Moines	87	55	...
Detroit	85	70	...
Duluth	85	47	...
Indianapolis	89	72	...
Kansas City	87	65	...
Milwaukee	88	62	...
Mpls.-St. P.	84	53	...
Omaha	81	60	...
St. Louis	96	66	1.09

WEST	H	L	Precip
Albuquerque	84	56	...
Anchorage	54	36	...
Bismarck	74	55	.12
Brownsville	96	78	...
Denver	83	64	...
Ft. Worth	91	75	...
Houston	93	78	...
Las Vegas	92	67	...
Los Angeles	83	65	...
Okla. City	100	73	.04
Phoenix	93	77	...
Salt L. City	76	60	...
San Antonio	98	77	...
San Diego	78	63	...

FOREIGN	High
City	
Aberdeen	57
Amsterdam	66
Ankara	75
Athens	84
Auckland	57
Berlin	63
Birmingham	52
Brussels	72
Cairo	84
Dublin	63
Geneva	70
Hong Kong	86
Lisbon	73
London	70
Madrid	88
Malta	82
Moscow	57
New Delhi	86
Nice	77
Paris	75
Rome	79
Saigon	84
Sydney	59
Tel Aviv	86
Tokyo	75
Vienna	66

PAN AMERICAN	High
Acapulco	90
Barbados	87
Bogota	66
Havana	88
Hermosillo	86
Kingston	88
Los Mochis	91
Mexico City	81
Monterrey	95
Nassau	90
San Juan, PR	88
St. Kitts	87
Vera Cruz	91

Cold Front Cools Off Great Plains States

On the heels of a cold front, sharply cooler air has invaded much of the Great Plains. Temperatures mostly in the 50s replaced readings in the 90s in much of South Dakota and Nebraska. Ahead of the front in the Midwest and southern Plains, warmer and more humid conditions were the rule with readings in the 80s and 90s. Precipitation was mostly light across the nation with amounts under a quarter of an inch. The national weather forecast: Showers and thundershowers will be scattered from the Mississippi River eastward and in the southern Plains. Fair and dry weather will prevail elsewhere. Warming is on tap from the intermountain region of the West to the Pacific Coast and in the Atlantic Coast states.

Weather Outlook

SMALL BOATS: Atlantic coastal waters — east and southeast winds 10-15 knots with seas 2-3 feet. Inland waters along the Southeast Florida coast including Biscayne and Florida bays—east and southeast winds 10-15 knots with a light to moderate chop on waters, except choppy near showers. Keys southward through the Florida Straits — southeast winds 15-20 knots with seas 3-5 feet. Gulf coastal waters — variable winds 10-15 knots with seas 2-4 feet.

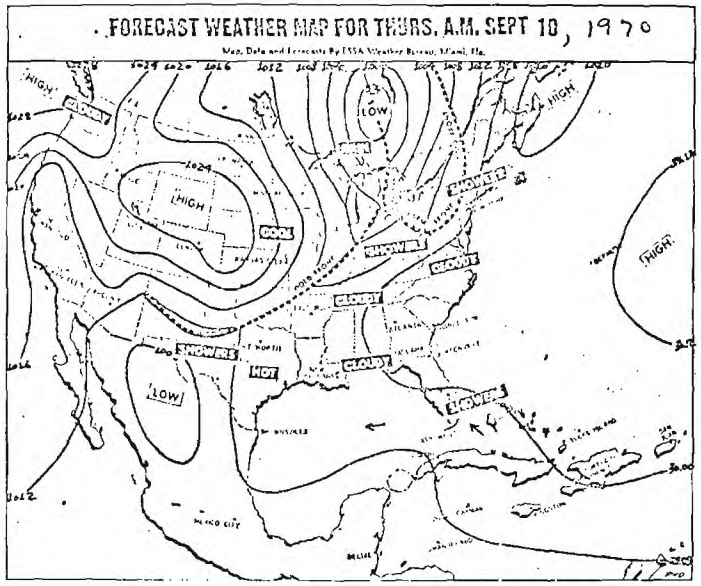
MIDDLE WEST COAST AND NAPLES AREAS: Partly cloudy through tomorrow with a chance of afternoon and evening thundershowers. Lows in the 70s. Highs 85 to 91. Mostly east and southeast winds 10 to 15 m.p.h. gusty near showers. Rain probability 50 per cent.

LAKE OKEECHOBEE AND INDIAN RIVER BREVARD AREAS: Partly cloudy through tomorrow with a chance of afternoon and evening thundershowers. Lows in the 70s. Highs 88 to 94. Mostly east and southeast winds 10 to 15 m.p.h. gusty near showers. Rain probability 50 per cent.

BROWARD-PALM BEACH AND KEYS AREAS: Mostly cloudy through tomorrow with showers likely. Lows in the upper 70s. Highs 85 to 91. East and southeast winds 15 to occasionally 20 m.p.h. gusty near showers. Rain probability 60 per cent.

FLORIDA: Partly cloudy with scattered showers likely throughout the state. Highs 88-94.

FLORIDA EXTENDED OUTLOOK: Saturday through Monday: Warm with scattered mainly afternoon thundershowers. Lows in 70s. Highs around 90.



Sunrise Today 7:04 a.m. Sunset Today 7:31 p.m.

Phases of the Moon

Oct. 7 Sept. 15 Sept. 22 Sept. 30

Moonrise Today 4:01 p.m. Moonset Fri. 2:35 a.m.

Local, National, World Temperatures

GREATER MIAMI

	H	L	Precip
Coral Gables	89	73	.03
Miami Airport	88	79	...
Miami Beach	86	79	...
North Miami Beach	93	74	...
South Miami	90	71	.19

FLORIDA

	H	L	Precip
Apalachicola	88	76	...
Bradenton	93	73	...
Clewiston	91	71	...
Daytona Bch.	90	75	...
Ft. Laud.	90	74	...
Ft. Myers	92	74	.13
Gainesville	90	72	...
Homestead	90	79	.01
Istamorada	87	78	...
Jacksonville	89	73	...
Key West	85	77	.22
Lakeland	91	74	...
Naples	93	72	.06
Ocala		74	...
Orlando	93	76	...
Sarasota	93	73	...
St. Pete	92	78	.01
Tallahassee	90	72	.25
Tampa	91	73	.44
Vero Beach	92	73	...
W.P. Bch		74	.20

SOUTH

	H	L	Precip
Asheville	84	62	.22
Atlanta	85	67	...
Birmingham	83	68	...
Charleston	84	70	...
Charlotte	85	68	...
Jkson, Miss.	93	71	...
Little Rock	92	72	...
Louisville	87	69	...
Memphis	93	75	...
New Orleans	89	72	.33
Raleigh	82	63	...
Richmond	87	65	...

EAST

	H	L	Precip
Albany, N.Y.	67	58	.09
Boston	64	54	.03
Buffalo	79	66	.17
New York	70	64	.09
Philadelphia	72	66	.32
Pittsburgh	82	67	.14
Washington	70	66	...

MIDWEST

	H	L	Precip
Chicago	89	61	...
Cincinnati	86	65	...
Cleveland	81	62	...
Columbus	82	62	...
Des Moines	89	62	1.92
Detroit	81	63	...
Indianapolis	84	58	...
Kansas City	99	71	.60
Milwaukee	75	50	...
Mnls St. P.	72	64	.11
Omaha	83	62	.10
St. Louis	90	63	.24

WEST

	H	L	Precip
Albuquerque	92	58	...
Bismarck	63	50	.62
Brownsville	97	73	...
Denver	74	54	...
Fort Worth	93	72	...
Houston	94	78	...
Las Vegas	100	68	...
Los Angeles	85	64	...
Okla. City	99	70	...
Phoenix	101	76	...
Salt L. City	68	45	...
San Antonio	97	76	...
San Diego	74	65	...
S. Francisco	73	55	...
Seattle	66	47	...

FOREIGN

	H	L	Precip
Aberdeen			55
Amsterdam			64
Ankara			72
Athens			86
Auckland			55
Berlin			72
Birmingham			55
Brussels			63
Casblanca			75
Copenhagen			63
Dublin			55
Geneva			77
Hong Kong			75
Lisbon			73
Madrid			77
Malta			82
Moscow			50
Paris			70
Rome			82
Saigon			81
Sydney			52
Tokyo			82
Tunis			88
Vienna			79
Warsaw			73

PAN AMERICAN

	H	L	Precip
Acapulco			88
Barbados			86
Bermuda			83
Culiacan			93
Havana			88
Hermosillo			97
Kingston			88
Mazatlan			84
Mexico City			73
Monterrey			97
Nassau			88
San Juan P.R.			86
St. Kitts			87
Vera Cruz			86

ATTACHMENT III

Auto- and Cross-Correlation Investigations of the Data From 22 September 1970

The data presented here were obtained from a limited analysis of the magnetic-tape records of the experiments on 22 September. They are believed to be representative of the general behavior of all the data recorded. They should be considered as guides to the direction which future, more detailed, analysis should take.

The auto- and cross-correlation plots shown in Figures III-1 through III-5 were made by re-playing the magnetic tape of the indicated data runs into a Fabri-Tek Model 1072 Signal Averager configured for computing such functions. Due to the design of the Model 1072, the resulting plots are only approximately normalized for signal distributions such as considered here; thus, care must be exercised in interpreting the value of the coefficients of the correlation functions obtained.

The correlation functions were computed and plotted for each frequency at each range point. These were reviewed for calibration difficulties, noise and hum problems, and reproducibility. The examples shown in Figures III-1 through III-5 were chosen as being representative and illustrative of the general conclusions about the correlation properties of these data runs on 22 September. These general conclusions are as follows. (1) The received signals are approximately periodic and have periods of 2 to 3 seconds, although there are other competing periodic components, principally a component with period between 6 and 7 seconds. (2) The fluctuations of received signals at any two frequencies are virtually uncorrelated. (3) The recorded samples are obtained from a process that is only approximately statistically stationary.

Except for III-3 and III-5b, the plots were all made with a dwell time of 40 milliseconds using 256 channels, which resulted in an approximate sweep duration of 10 seconds. The amplitude and d-c level of the input signals were adjusted to minimize overflow problems in the A/D converter of the Model 1072. The noise reference was adjusted to have approximately the same rms value as the corresponding data record. The square-wave reference was adjusted to have a peak amplitude approximately equal to the "average of the peaks" of the corresponding data record.

Sixteen sweeps of 10 seconds each were overlaid for each plot; since most of the samples on the magnetic tape are of one-minute duration, this required several passes of the tape. The only problem encountered with this overlaying process was that tape-transients prevented the stripping of the d-c component with high-pass filters; such stripping would have provided a more accurate zero reference for the plots. This problem was not resolved due to the limited amount of time available for this analysis.

Figure III-3 and III-4 are included to illustrate the similarity between the auto-correlation functions of the signals at different frequencies (compare with Figure III-1), and also to demonstrate the reproducibility of some of the data records.

Figure III-5 illustrates a data run which exhibited rather different behavior near the end of the sample period for which no explanation has been found. The auto-correlation plot of Figure III-5A was made from the complete data record for that run and includes the last ten seconds of data which exhibit the unusual behavior. Figure III-5B shows a smoothed time history of this portion of the record. Figure III-1B shows the results obtained when the unusual signal is deleted.

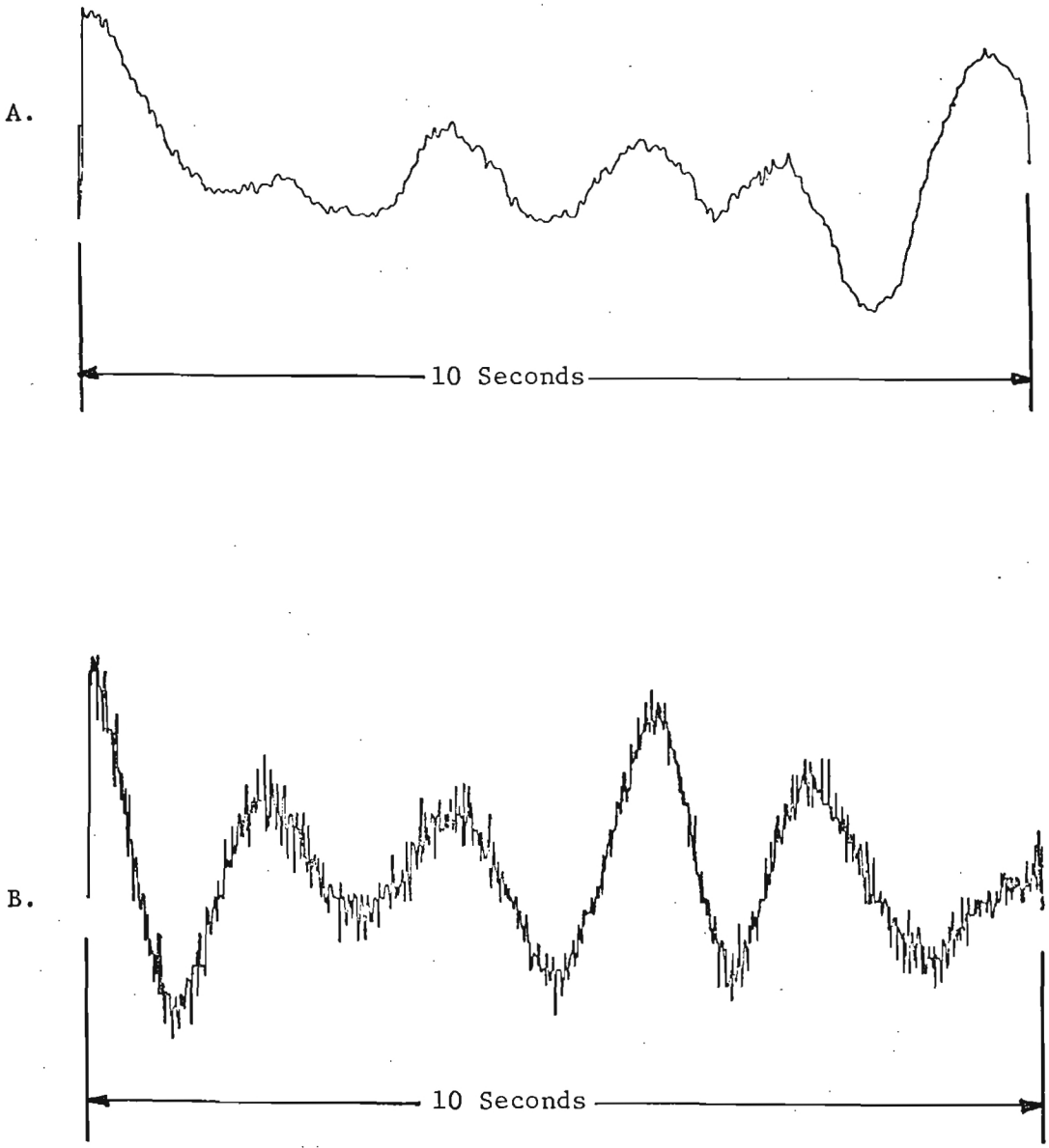


Figure III-1. Comparison between auto-correlation plots for (A) a noise signal (Gaussian, 0.5 Hz bandwidth filter) and (B) the received signal on 30 MHz (Run 2, 22 September).

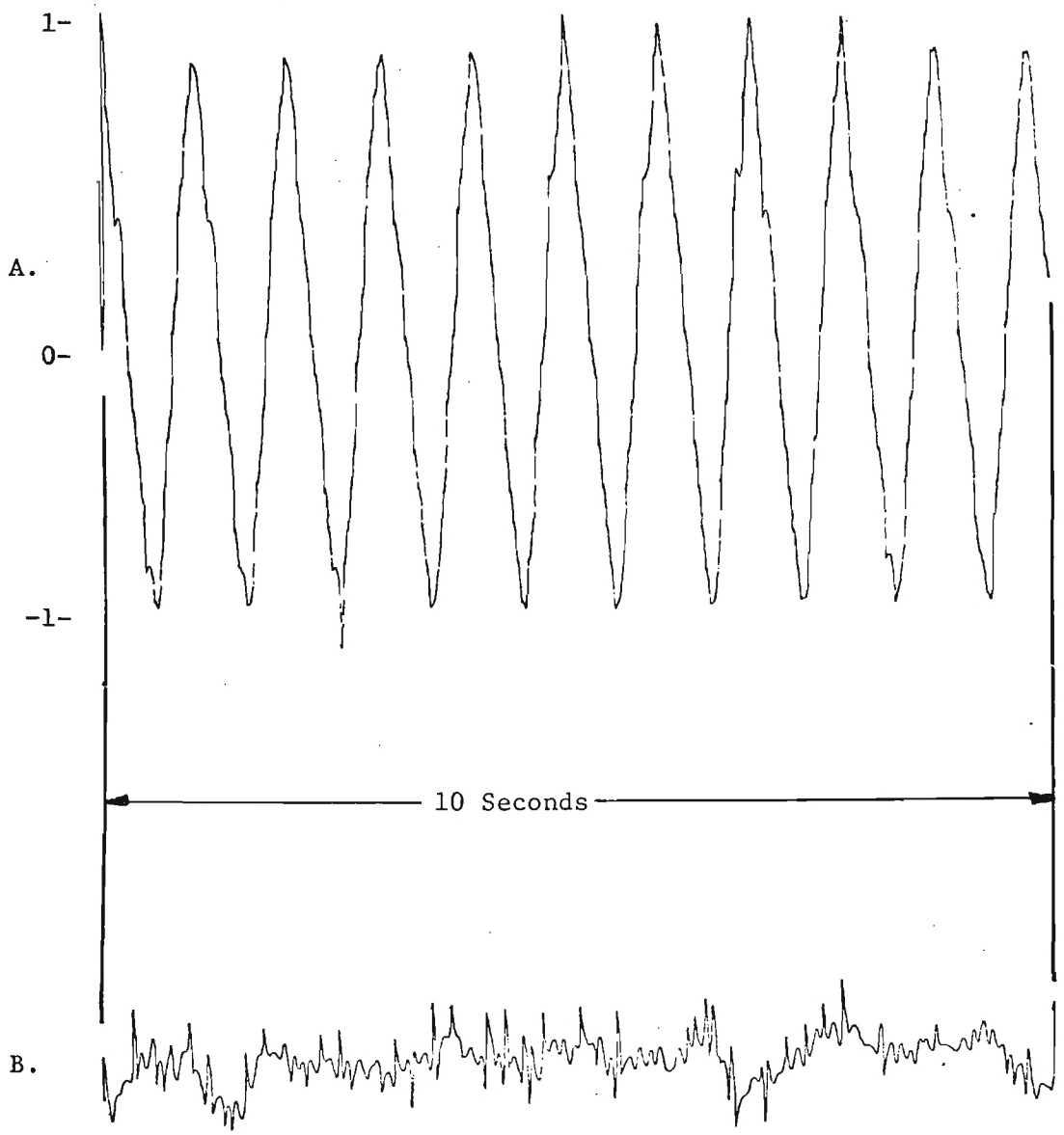


Figure III-2. Comparison between cross-correlation plots for (A) a square-wave signal (1 Hz period) and (B) the product of the received signals on 412 and 140 MHz (Run 2, 22 September).

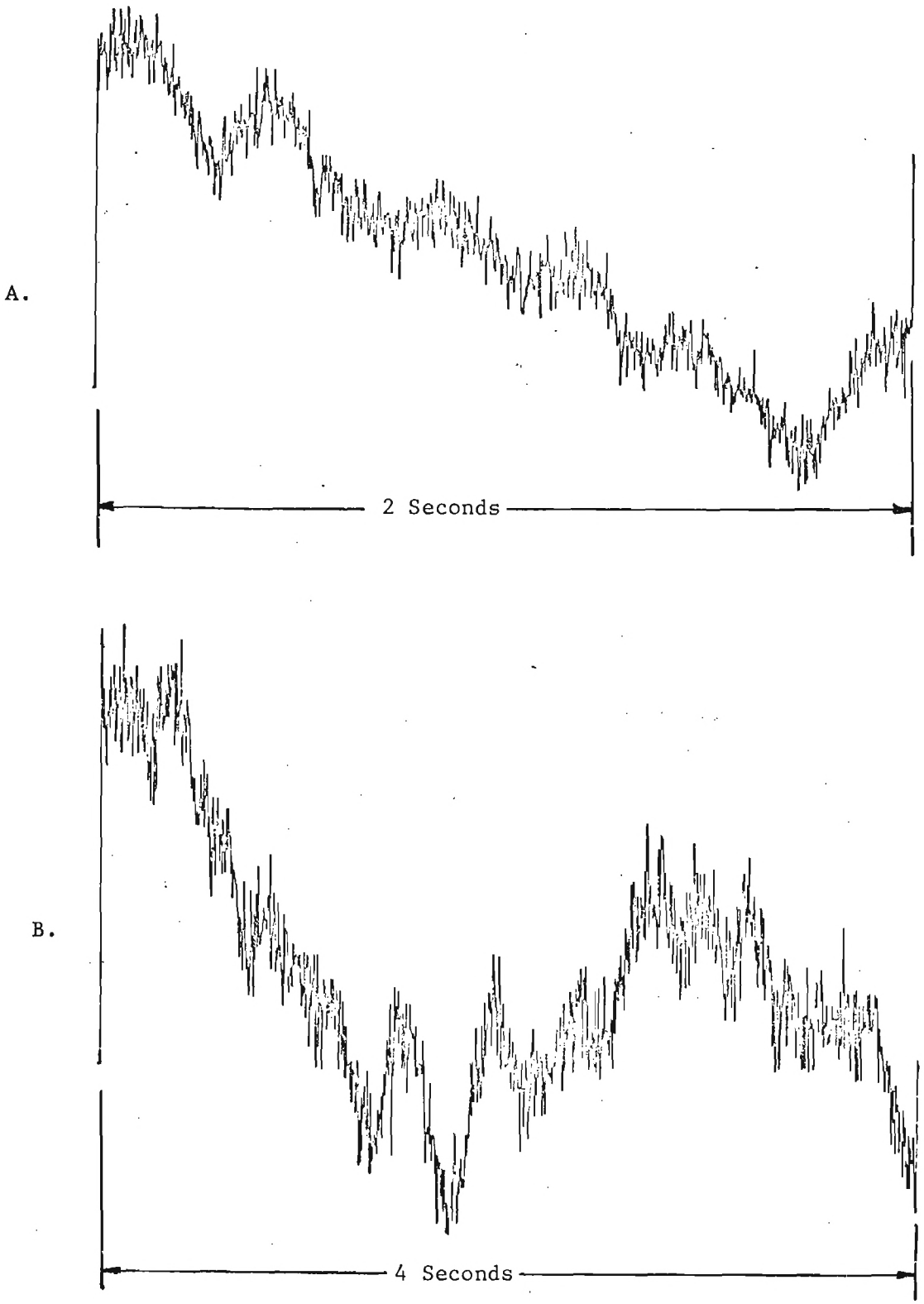


Figure III-3. Comparison between auto-correlation plots of (A) two-and (B) four-seconds duration for the same received signal on 412 MHz (Run 2, 22 September).

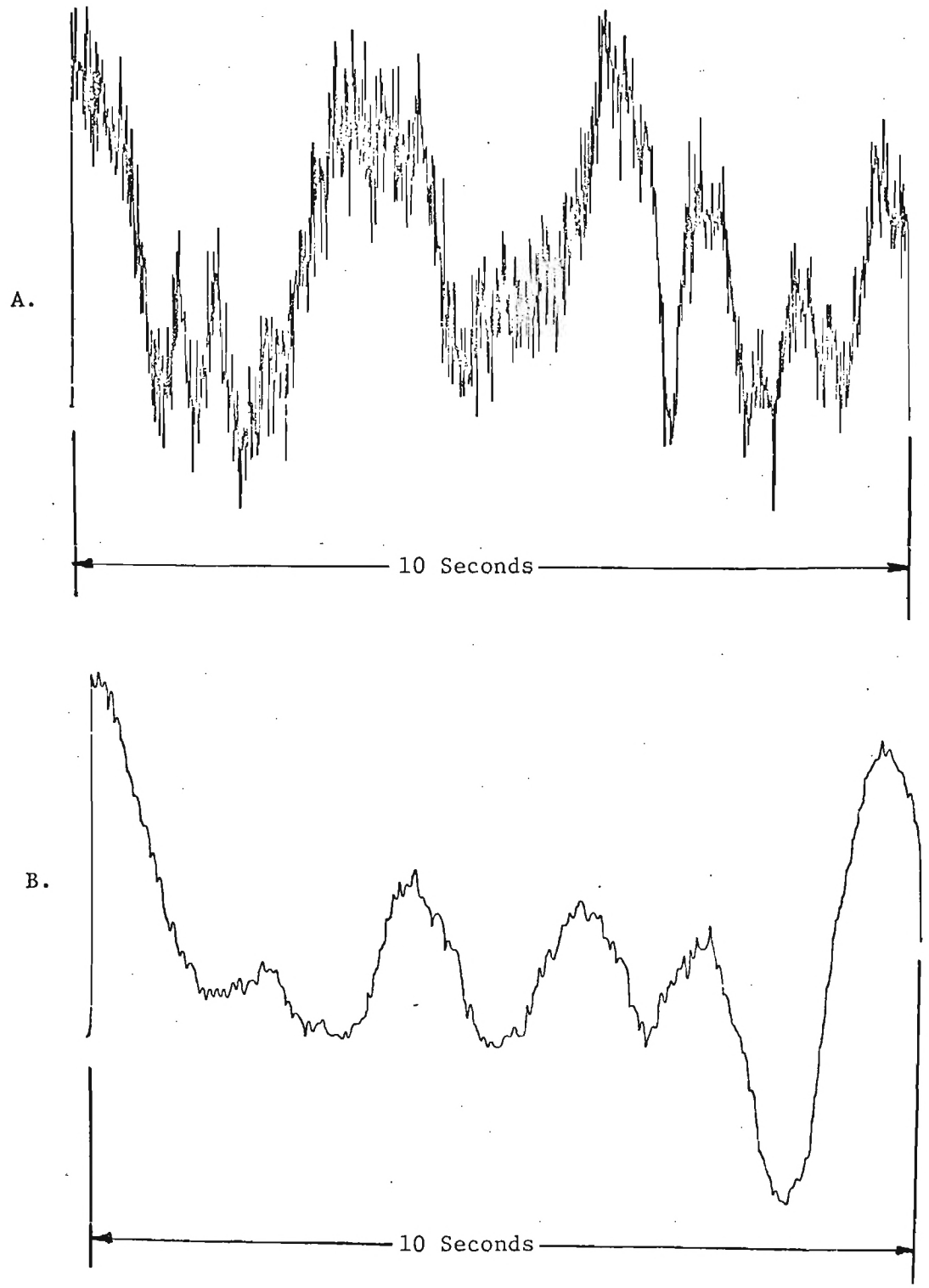


Figure III-4. Comparison between auto-correlation plots of (A) the received signal on 412 MHz (Run 2, 22 September) and (B) a noise signal (Gaussian, 0.5 Hz bandwidth filter).

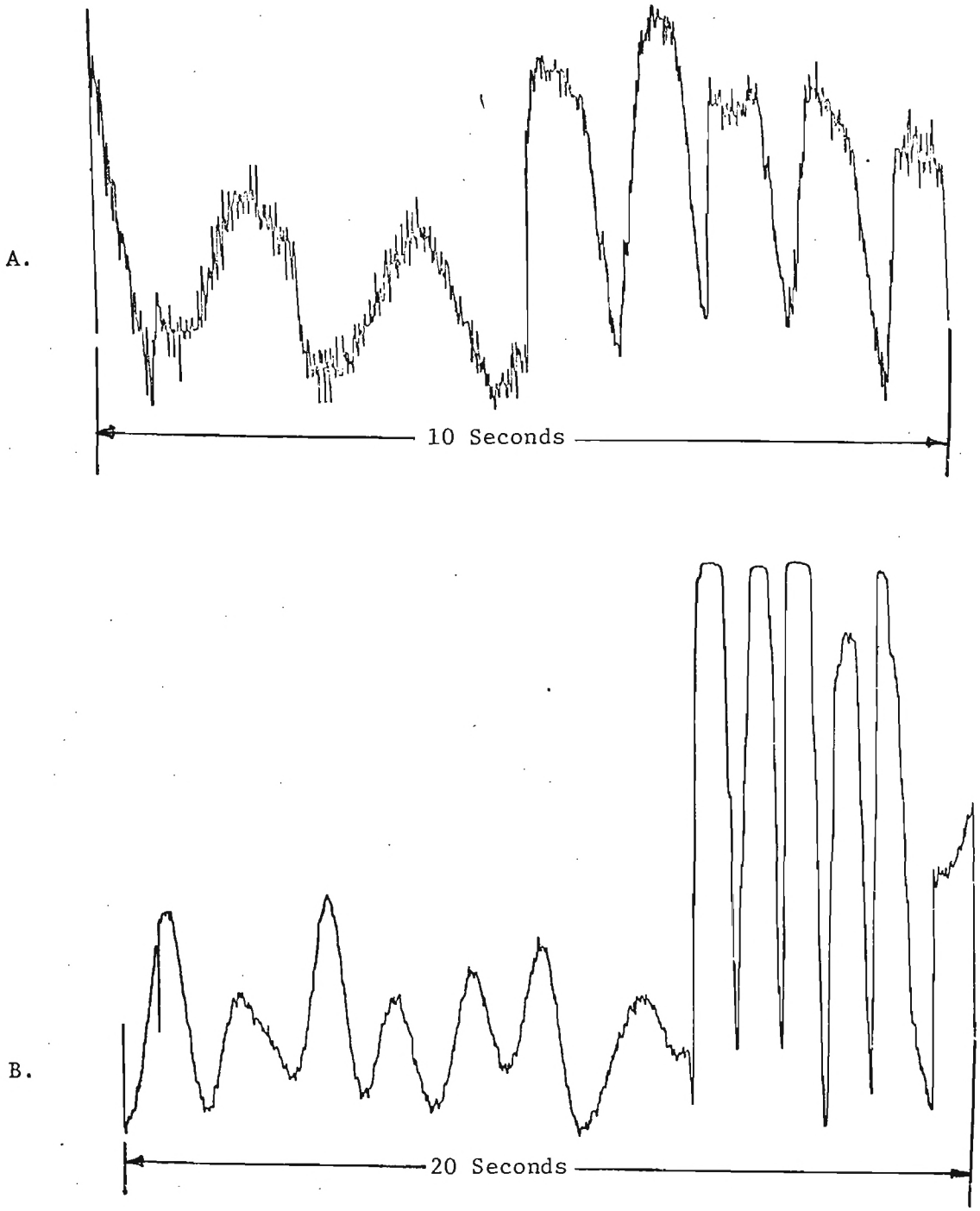


Figure III-5. Comparison between the auto-correlation plot of (A) the complete record of the received signal on 30 MHz for Run 2 (22 September) and (B) the smoothed time history of the received signal.